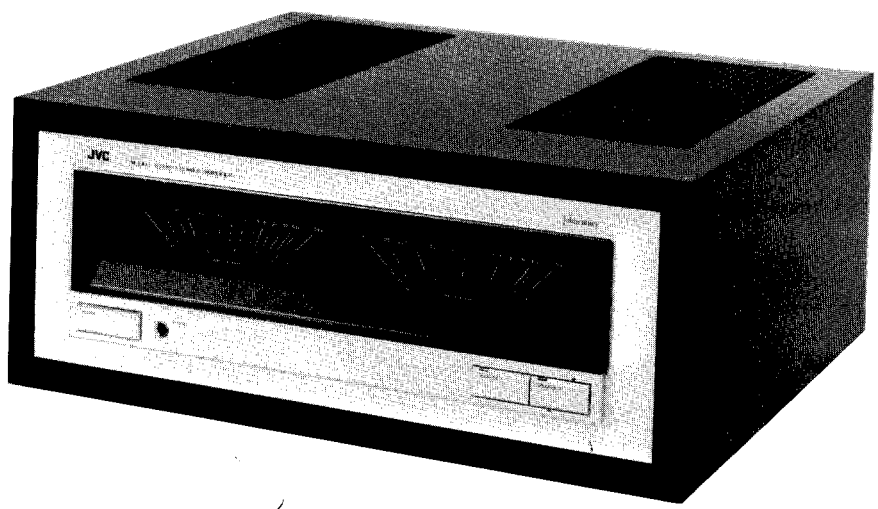
JVC

# SERVICE MANUAL

## MODEL
# M-L10
## STEREO POWER AMPLIFIER



No. 2620
May. 1982

This manual combines four single volumes.

1. Instruction Manual.
2. Technical Manual.
3. Service Manual.
4. Parts Manual.

# M-L10

# INSTRUCTION MANUAL

## IMPORTANT (In the United Kingdom)
## Mains Supply (AC 240 V~, 50 Hz only)

### IMPORTANT

Do not make any connection to the Larger Terminal coded E or Green. The wires in the mains lead are coloured in accordance with following code:

Blue to N (Neutral) or Black
Brown to L (Live) or Red

If these colours do not correspond with the terminal identifications of your plug, connect as follows:
Blue wire to terminal coded N (Neutral) or coloured Black.
Brown wire to terminal coded L (Live) or coloured Red.
*If in doubt – consult a competent electrician.*

**Note: We recommend that you should disconnect the AC cord from the outlet when not in use.**

### WARNING
Dangerous voltage inside

### CAUTION
To prevent electric shock, do not remove screws, covers or cabinet.
No user-serviceable parts inside. Refer servicing to qualified service personnel.

### WARNUNG
Gefährliche Spannung im Innern

### ACHTUNG
Zur Vermeidung von Kurzschlüssen sollten Schrauben, Abdeckplatten und Gehäuse nicht entfernt werden.
Das Gerät enthält keine von Laien reparierbaren Einzelteile. Reparaturen nur von einem qualifizierten Kundendienst ausführen lassen.

### AVERTISSEMENT
Tension dangereuse à l'intérieur

### ATTENTION
Afin de prévenir un choc électrique, ne pas enlever les vis, ni les couvercles. Il ne se trouve à l'intérieur aucune pièce pouvant être réparée par l'usager. S'adresser à un réparateur compétent.

Thank you for purchasing this JVC product.
Before you begin operating this unit, please read the instruction book carefully to be sure you get the best possible performance.
If you have any question, consult your JVC dealer.

# CONTENTS


Important . . . . . 1
Connection diagram . . . . . 3
Front panel . . . . . 5
Specifications . . . . . 7
Power specifications . . . . . 8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Vielen Dank für den Kauf dieses JVC-Produkts.
Bitte lesen Sie diese Bedienungsanleitung sorgfältig, bevor Sie dieses Gerät in Betrieb nehmen, um die beste Leistung zu erhalten.
Falls Sie Fragen haben, wenden Sie sich bitte an Ihren JVC-Fachhändler.

# INHALT


Wichtig . . . . . 1
Anschlußdiagramm . . . . . 3
Frontplatte . . . . . 5
Technische Daten . . . . . 7
Spannungsversorgung . . . . . 8


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Tous nos compliments pour vous être procuré cet appareil de JVC. Pour que vous puissiez obtenir les meilleures performances possibles, nous vous recommandons de lire attentivement le manuel d'instructions avant de commencer à utiliser votre nouvel appareil.
En cas de question, consultez votre revendeur JVC.

# SOMMAIRE


Important . . . . . 2
Schéma des connexions . . . . . 3
Panneau avant . . . . . 5
Caractéristiques techniques . . . . . 7
Spécification d'alimentation . . . . . 8

# IMPORTANT

■ **Safety precautions**

1. To prevent fire or electric shock, be careful when handling the power cord.
2. It is dangerous to use this unit if smoke, strange smells, or other unusual symptoms occur.
   In such a case, unplug the power cord and consult your JVC dealer.
3. There are no user serviceable parts inside.
4. Do not place objects containing water on this unit.
5. Do not allow any metallic or inflammable object inside this unit through the ventilation holes, etc.

■ **Installation**

1. Do not place the unit too close to a heater, and keep it away from direct sunlight, to avoid deformation and discoloration.
2. Avoid humidity, dust and vibration.
3. Avoid quick movement from a cold place to a warm place.
   If a rapid change in temperature occurs, this unit may not function correctly immediately after being moved.
   This is due to moisture condensation on the operating parts. After a short time, it will function normally.
4. Do not hamper ventilation.
   Because ventilation holes are provided on the base to prevent high internal temperatures, do not place the unit in a narrow or poorly ventilated place, nor fill the ventilation holes with tape or cloth.
5. Avoid unstable placement.
   Do not place the unit on an incline, or on a weak table.

■ **Precautions for handling**

1. Stacking.
   Avoid using the unit in a stack; because if a preamplifier or other equipment is put on this unit, a malfunction may occur due to heat trapped by blocked ventilation, or deformation or surface damage to the cabinet may be caused. In addition, the power transformer inside this unit may cause hum in a preamplifier or noise in the AM section of a tuner.
2. Usage over long periods.
   When using it for a long time at more than 10 watts output (on the average), leave space above the upper panel of this unit to obtain good ventilation.

■ **Maintenance of cabinet**

When the cabinet becomes dirty or dusty, etc., wipe with a soft cloth soaked in a liquid wax (silicon wax, etc.) and then wipe evenly with a dry cloth.
Do not use thinner or benzine because cracks or discoloration may occur.

# WICHTIG

■ **Sicherheitsvorkehrungen**

1. Gehen Sie sorgsam mit dem Netzkabel um, um Feuer und elektrische Schläge zu vermeiden.
2. Es ist gefährlich, dieses Gerät zu betreiben, wenn Rauch, seltsame Gerüche und andere ungewöhnliche Symptome auftreten.
   Ziehen Sie in solchen Fällen das Netzkabel aus der Steckdose und wenden sich an Ihren JVC-Fachhändler.
3. Das Gerät enthält keine Teile, die vom Benutzer gewartet werden können.
4. Stellen Sie keine Gefäße mit Wasser auf dieses Gerät.
5. Achten Sie darauf, daß keine metallischen oder entflammbaren Materialien durch die Belüftungsöffnungen usw. in das Gerät eindringen.

■ **Aufstellung**

1. Stellen Sie das Gerät nicht zu nahe an einer Heizung auf und setzen Sie es nicht direktem Sonnenlicht aus, um Verformungen und Farbänderungen zu vermeiden.
2. Setzen Sie das Gerät nicht Feuchtigkeit, Staub oder Vibrationen aus.
3. Das Gerät sollte nicht rasch von einem kalten Ort zu einem warmen Ort transportiert werden. Nach schnellen Temperaturänderungen funktioniert das Gerät eventuell nicht ordnungsgemäß, weil sich auf den inneren Teilen Feuchtigkeit niedergeschlagen hat. Nach einer kurzen Zeit wird das Gerät wieder normal funktionieren.
4. Hemmen Sie die Belüftung nicht.
   Am Boden des Geräts befinden sich Belüftungsöffnungen, um hohe Temperaturen im Innern zu verhindern. Stellen Sie das Gerät nicht an einem engen oder schlecht belüfteten Ort auf und verschließen Sie die Belüftungsöffnungen nicht mit Klebeband oder Textilien.
5. Vermeiden Sie eine unstabile Aufstellung.
   Stellen Sie das Gerät nicht auf eine geneigte oder unstabile Unterlage.

■ **Vorsichtsmaßnahmen beim Betrieb**

1. Stapeln.
   Vermeiden Sie eine stapelweise Aufstellung, denn wenn der Vorverstärker oder andere Gerät auf dieses Gerät gestellt werden, könnten durch gestaute Hitze wegen blockierter Belüftungsöffnungen Fehlfunktionen auftreten oder Verformungen oder Beschädigungen des Gehäuses verursacht werden. Außerdem könnte der Leistungstransformator dieses Geräts Brummstörungen im Vorverstärker oder Störgeräusche im MW-Empfangsteil des Tuners verursachen.
2. Betrieb über lange Zeiträume.
   Wenn dieses Gerät lange Zeit mit mehr als 10 Watt Ausgang (Durchschnitt) betrieben wird, muß oberhalb des Geräts genug Raum gelassen werden, um eine gute Belüftung sicherzustellen.

■ **Pflege des Gehäuses**

Wenn das Gehäuse schmutzig oder staubig ist, sollte es mit einem weichen Tuch, das in flüssiges Wachs (Silizium-Wachs o.ä.) getaucht wurde, gereinigt werden. Wischen Sie mit einem trockenen Tuch nach.
Verwenden Sie keinen Verdünner und kein Benzin, um Beschädigungen und Verfärbungen zu vermeiden.

# IMPORTANT

## ■ Précautions à observer

1. Pour éviter les risques d'incendie ou d'électrocution, manier le fil de branchement avec précaution.
2. L'emploi de cet appareil est dangereux dans le cas d'apparition de fumée, d'odeurs étranges ou d'autres symptômes inhabituels.
   Dans de tels cas, débrancher l'appareil et consulter votre revendeur JVC.
3. Aucune pièce intérieure n'est à régler par l'utilisateur.
4. Ne pas placer d'objet contenant de l'eau sur cet appareil.
5. Ne pas laisser tomber d'objets métalliques ou inflammables à l'intérieur par les trous de ventilation etc.

## ■ Installation

1. Ne pas placer cet appareil trop près d'un radiateur et le tenir à l'écart de la lumière directe du soleil pour éviter sa déformation et sa décoloration.
2. Eviter les endroits humides ou pussiéreux et les vibrations.
3. Eviter les changements brusques de température d'une pièce froide à une pièce chaude. Lors d'un changement brusque de température, cet appareil risque de ne pas bien fonctionner après son déplacement. Ceci est dû à la condensation d'humidité sur les pièces nécessaires au fonctionnement. Il refonctionnera normalement après un court instant.
4. Ne pas obstruer les bouches d'aération.
   Des trous d'aération sont situés sur la base de l'appareil pour éviter des températures internes élevées. Ne pas le placer à un endroit étroit ou mal aéré. Ne pas boucher les trous d'aération avec du ruban adhésif ou du tissu.
5. Eviter de le placer à un endroit instable.
   Ne pas placer l'appareil sur un plan incliné ou sur une table qui n'est pas solide.

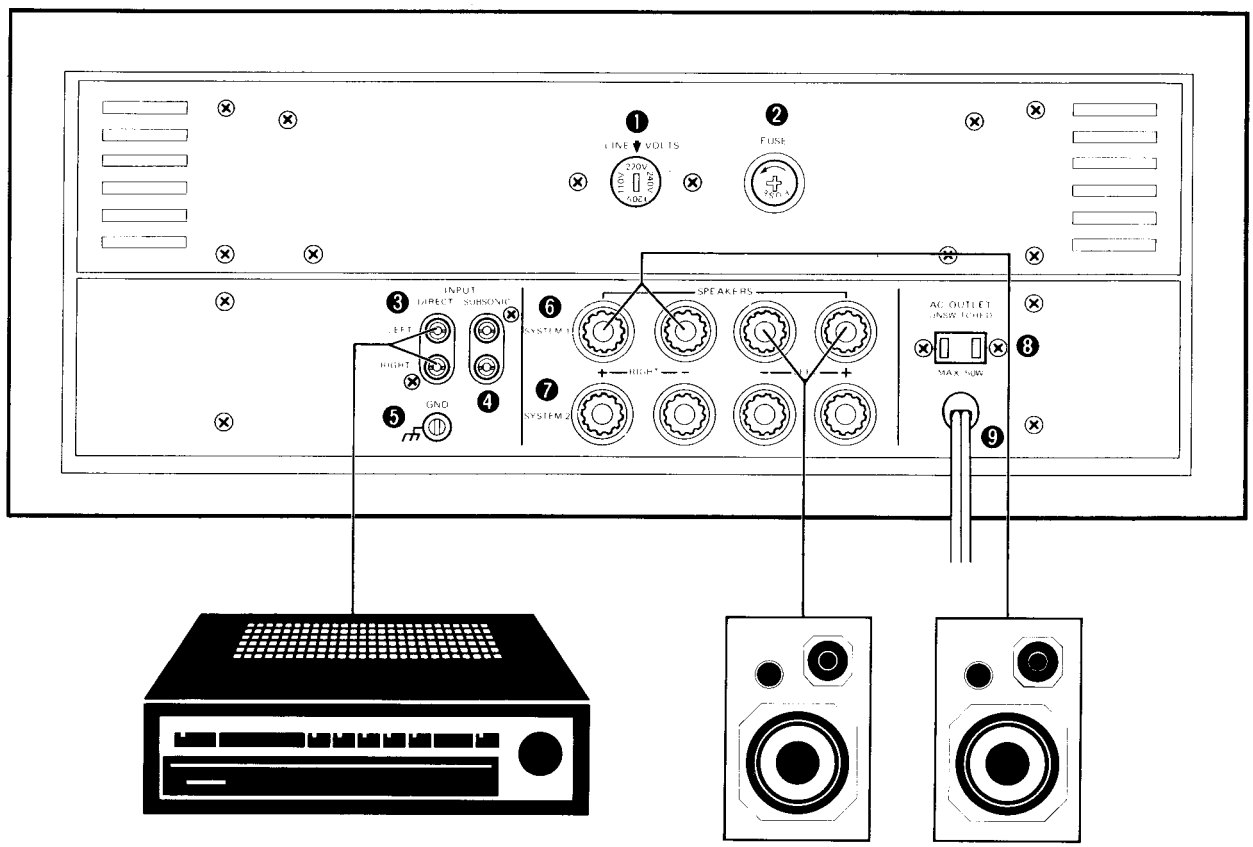
## ■ Précautions à observer lors de la manipulation

1. Empilage.
   Eviter de superposer cet appareil avec d'autres. Si un préamplificateur ou quelque autre appareil est placé sur celui-ci, il risque de mal fonctionner à cause de l'emmagasinage de chaleur dû au blocage de l'aération, ou bien une déformation ou des dégâts de la surface du coffret risquent de se produire. De plus, le transformateur de puissance incorporé dans cet appareil risque de produire des ronflements dans un préamplificateur ou des bruits dans la section AM d'un tuner.
2. Utilisation pendant une longue période
   Quand vous utilisez cet appareil pendant longtemps avec une sortie supérieure à 10 watts (en moyenne), laissez un espace au-dessus du panneau supérieur pour permettre une bonne aération.

## ■ Entretien du coffret

Lorsque le coffret est sale ou poussiéreux etc. l'essuyer avec un chiffon doux imbibé de cire liquide (cire aux silicones etc.) puis le frotter uniformément avec un chiffon sec.
Ne pas utiliser de dilvant ni de benzine parce qu'ils risquent de provoquer des craquelures ou une décoloration.

# CONNECTION DIAGRAM
# ANSCHLUSSDIAGRAMM
# SCHEMA DES CONNEXIONS



❶ AC LINE VOLTAGE SELECTOR
(Not provided on units for Continental Europe, the United Kingdom, Australia, U.S.A. and Canada.)
❷ AC fuse socket
❸ INPUT (DIRECT)
Can be connected directly.
❹ INPUT (SUBSONIC)
Prevents intermodulation distortion by infrasonic frequencies because frequencies below 16 Hz pass through a filter to be attenuated by 6 dB/oct.
❺ GND terminal
❻ SPEAKERS SYSTEM-1 terminals
❼ SPEAKERS SYSTEM-2 terminals
❽ UNSWITCHED AC outlet
(Not provided on units for Continental Europe, the United Kingdom and Australia.)
❾ Power cord

## NOTES

1. **Connect source components with left and right channels connected correctly. Reversed channels will degrade the stereo effect.**
2. **Connect speakers with correct polarity; (+) to (+) and (-) to (-). Reversed polarity will degrade the stereo effect.**
3. **Switch the power off when connecting any component.**
4. **Connect plugs or wires firmly. Poor contact may result in hum.**
5. **Use speakers with the correct impedance.**
**This amplifier is for use with speakers with impedances from 4 to 16 ohms when a single pair of speakers is used and with impedances of 8 to 16 ohms when two pairs of speakers are used. Be sure to provide good ventilation. (The temperature rise of the cabinet may not satisfy BS 415 or IEC 65 standards.)**

❶ Netzspannungswähler (AC LINE VOLTAGE SELECTOR)
(Nicht an Geräten, die für Kontinental-Europa, Großbritannien, Australien, die USA und Kanada bestimmt sind.)
❷ Netzspannungs-Sicherungshalter
❸ Direkteingang (INPUT (DIRECT))
Zum direkten Anschluß.
❹ Unterschalleingang (INPUT (SUBSONIC))
Zur Verhinderung von Intermodulationsverzerrungen durch infratonale Frequenzen. Frequenzen unter 16 Hz werden durch einen Filter geleitet und um 6 dB/Okt. gedämpft.
❺ Erdungsbuchsen (GND)
❻ Lautsprechersystem-1-Buchsen (SPEAKERS SYSTEM-1)
❼ Lautsprechersystem-2-Buchsen (SPEAKERS SYSTEM-2)
❽ Unbeschalteter Netzausgang (UNSWITCHED AC)
(Nicht an Geräten, die für Kontinental-Europa, Großbritannien und Australien bestimmt sind.)
❾ Netzkabel

## HINWEISE

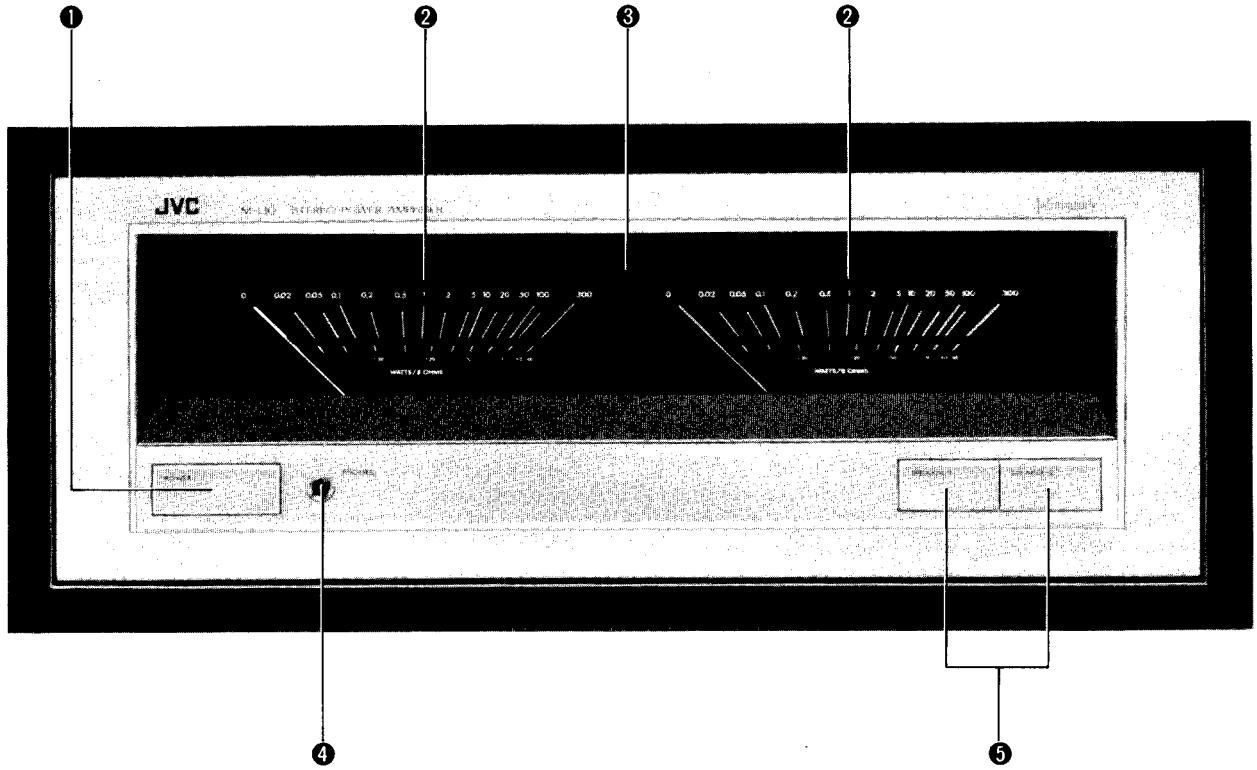
1. **Schließen Sie die Tonquellen-Komponenten mit deren linken und rechten Kanälen richtig verbunden an. Verkehrt angeschlossene Kanäle beeinträchtigen den Stereo-Effekt.**
2. **Schließen Sie die Lautsprecher mit der korrekten Polarität an: (+) an (+) und (-) an (-). Eine umgekehrte Polarität beeinträchtigt den Stereo-Effekt.**
3. **Schalten Sie den Netzschalter aus, wenn Sie irgendeine Komponente anschließen.**
4. **Verbinden Sie die Stecker und Drähte gut. Ein schlechter Kontakt kann zu Brummgeräuschen führen.**
5. **Benutzen Sie Lautsprecher mit richtiger Impedanz.**
**Dieser Verstärker ist ausgelegt für Lautsprecher mit 4 bis 16 Ohm Impedanz bei der Benutzung eines Paares Lautsprecher und für Lautsprecher mit 8 bis 16 Ohm Impedanz bei der Benutzung von zwei Paar Lautsprechern. Sorgen Sie für eine gute Belüftung.**
**(Der Temperaturanstieg könnte den BS415- oder IEC 65-Normen nicht entsprechen.)**

❶ Sélecteur de tension CA (AC LINE VOLTAGE SELECTOR)
(N'existe pas sur les appareils destinés à l'Europe Continentale, au Royaume-Uni, à l'Australie, aux Etats-Unis et au Canada.)
❷ Douille de fusible CA
❸ Entrée (INPUT) (DIRECTE)
Peut être raccordé directement.
❹ Entrée (INPUT) (SUBSONIC)
Prévient la distorsion d'intermodulation par des fréquences infra-acoustiques car les fréquences inférieures à 16 Hz traversent un filtre qui les atténue de 6 dB/oct.
❺ Borne de prise de terre (GND)
❻ Bornes H.P.-1 (SPEAKERS SYSTEM-1)
❼ Bornes H.P.-2 (SPEAKERS SYSTEM-2)
❽ Arrivée secteur non commutée (CA)
(N'existe pas sur les appareils destinés à l'Europe Continentale, au Royaume-Uni et à l'Australie.)
❾ Câble d'alimentation

## REMARQUES

1. **Ne pas inverser les canaux droit et gauche lors du raccordement des appareils de source sonore, sinon l'effect stéréophonique risque de perdre de sa qualité.**
2. **Respecter les polarités des enceintes lors de leur raccordement (les polartités positives (+) entre elles, et les polarités négatives (-) entre elles), sinon l'effet stéréophonique risque de perdre de sa qualité.**
3. **Débrancher l'alimentation secteur lors du raccordement d'un autre élément de chaîne stéréo.**
4. **S'assurer que les prises et les fils sont raccordés correctement. Un mauvais contact risque de produire des bruits de bourdonnement parasites.**
5. **Utiliser des haut-parleurs à impédance correcte.**
**Cet amplificateur est conçu pour être utilisé avec des haut-parleurs à impédance de 4 à 16 ohms avec une paire de baffles et à impédance de 8 à 16 ohms avec deux paires de baffles. Bien s'assurer de procurer une ventilation suffisant. (L'accroissement de la température peut ne pas satisfaire les standards BS 415 ou IEC 65).**

# FRONT PANEL
# FRONTPLATTE
# PANNEAU AVANT




❶ **POWER switch**
Press to switch on power. The yellow indicator in the button will light and the power meters will be illuminated. Press again to switch off the power.

**Note:**

- **Because a power transformer with a large capacity is installed in this unit, a little hum may be heard when the power is turned on. This is inevitable due to the large power capacity transformer, not a malfunction. This hum will decrease to a normal level about 30 seconds after the power is turned on.**

❷ **POWER meter**
This logarithmic scale shows the power when the speakers have an impedance of 8 ohms.

❸ **Meter illumination**
When the power switch is initially set to on or when the protection circuit operates due to a malfunction, the illumination changes to red.
After 5 – 6 seconds, it should change back to its normal white illumination. If it does not, turn off the power switch and investigate.

**Note:**

- **This unit is designed to protect the amplifier and the speakers from damage in the following cases using a protection circuit.**
  **1) When an input surge occurs or the sepaker terminals are short-circuited.**
  **2) If more than ± 3 V output is applied to the speaker terminals when direct current is input to the DIRECT input terminals.**
  **When the protection circuit functions, the power meter light becomes red to indicate a malfunction. In this case, switch off the POWER switch and investigate. After removing the cause of the malfunction, switch the POWER switch on again.**

❹ **PHONES (headphones) jack**
Plug stereo headphones into this jack.

**Note:**

- **When headphones are plugged in, speaker sound will not be switched off. To listen to the headphones on their own, set the SPEAKER switches off.**

❺ **SPEAKER switches**
Press to turn on the speakers. When on, the blue indicators in the switches light. Press again to turn off.

**SYSTEM-1:** Press to listen to the speakers connected to the SYSTEM-1 terminals.

**SYSTEM-2:** Press to listen to the speakers connected to the SYSTEM-2 terminals.

When both are switched on, sound will be heard from both sets of speaker systems.

**❶ Netzschalter (POWER)**
Durch Drücken dieses Schalters wird die Spannungsversorgung eingeschaltet, die gelbe Anzeige in der Taste leuchtet und die Ausgangs-Meßinstrumente sind beleuchtet. Durch nochmaliges Drücken wird die Spannungsversorgung wieder ausgeschaltet.

**Hinweis:**

- **Weil dieses Gerät einen Leistungstransformator mit großer Kapazität verwendet, kann nach dem Einschalten ein geringfügiges Brummen auftreten. Dies ist keine Fehlfunktion, sondern beruht auf eine unvermeidbare Eigenschaft von Leistungstransformatoren mit großer Kapazität. Dieses Brummen verringert sich etwa 30 Sekunden nach dem Einschalten der Spannungsversorgung auf einen normalen Pegel.**

**❷ Ausgangs-Meßinstrument (POWER)**
Auf dieser logarithmischen Skala wird die Ausgangsleistung angezeigt, wenn die Lautsprecher eine Impedanz von 8 Ohm haben.

**❸ Instrumentenbeleuchtung**
Die Beleuchtung wechselt auf Rot, wenn die Spannungsversorgung eingeschaltet oder wenn die Schutzschaltung wegen einer Fehlfunktion aktiviert wird.
Nach 5 bis 6 Sekunden sollte die Beleuchtung auf die normale weiße Farbe zurückwechseln. Wenn nicht, sollte die Spannungsversorgung ausgeschaltet und nach der Störungsursache gesucht werden.

**Hinweis:**

- **Dieses Gerät ist mit einer Schutzschaltung zum Schutz des Verstärkers und der Lautsprecher ausgestattet, die in den folgenden Fällen aktiviert wird:**
  **1) Bei einem plötzlichen Anstieg des Eingangssignals oder bei einem Kurzschluß der Lautsprecherbuchsen.**
  **2) Wenn den DIRECT-Eingangsbuchsen Gleichspannung zugeführt wird und an den Lautsprecherbuchsen mehr als ± 3 V Ausgangsspannung erscheint.**
  **Wenn die Schutzschaltung aktiviert wird, wird die Beleuchtung des Meßinstruments rot, um die Fehlfunktion anzuzeigen. Schalten Sie in einem solchen Fall die Spannungsversorgung aus und gehen Sie der Störungsursache nach. Schalten Sie die Spannungsversorgung wieder ein, nachdem Sie die Ursache der Fehlfunktion beseitigt haben.**

**❹ Kopfhörerbuchse (PHONES)**
Zum Anschluß eines Stereokopfhörers.

**Hinweis:**

- **Die Lautsprecher werden durch Anschließen des Kopfhörers nicht ausgeschaltet. Schalten Sie die SPEAKER-Schalter aus, um nur über Kopfhörer zu hören.**

**❺ Lautsprecherschalter (SPEAKER)**
Drücken Sie diese Schalter zum Einschalten der Lautsprecher, die blauen Anzeigen in den Schaltern leuchten. Durch nochmaliges Drücken werden die Lautsprecher wieder ausgeschaltet.

**SYSTEM-1:** Zum Hören der Lautsprecher, die an den SYSTEM-1-Buchsen angeschlossen sind.
**SYSTEM-2:** Zum Hören der Lautsprecher, die an den SYSTEM-2-Buchsen angeschlossen sind.

Wenn beide Schalter eingeschaltet sind, wird der Ton von beiden Lautsprechersystemen gehört.

**❶ Interrupteur d'alimentation (POWER)**
Appuyer sur l'interrupteur pour mettre l'appareil en circuit. Le voyant jaune du bouton s'allume et les indicateurs de puissance seront éclairés. Pour mettre l'appareil hors circuit, appuyer de nouveau sur l'interrupteur.

**Remarque:**

- **Du fait qu'un transformateur de puissance de grande capacité est incorporé dans cet appareil, un léger bourdonnement peut être audible au moment de la mise en circuit. Ceci est inévitable et est dû au transformateur de grande capacité de puissance; ce n'est pas une panne. Ce bourdonnement décroîtra pour atteindre un niveau normal 30 secondes environ après la mise en circuit.**

**❷ Indicateur de puissance (POWER meter)**
Cette échelle logarithmique indique la puissance quand les haut-parleurs ont une impédance de 8 ohms.

**❸ Eclairement de l'indicateur**
Cet éclairement vire au rouge lorsque l'interrupteur d'alimentation est branché ou quand le circuit de protection se met en march à cause d'un mauvais fonctionnement.
Il devrait revenir à sa couleur initiale, blanc, après 5 à 6 secondes. S'il n'y revient pas, couper le contact et en chercher la cause.

**Remarque:**

- **Cet appareil est conçu de manière à protéger l'amplificateur et les haut-parleurs d'endommagements dans les cas suivants grâce à un circuit de protection.**
  **1) Lors d'une saute de courant à l'entrée ou d'un court-circuit des bornes des haut-parleurs.**
  **2) Si une sortie équivalente à ± 3 V est appliquée aux bornes des haut-parleurs alors qu'un courant continu entre aux bornes d'entrée DIRECT.**
  **Lorsque le circuit de protection fonctionne, l'éclairage de l'indicateur de puissance tourne au rouge pour indiquer un mauvais fonctionnement. Dans ce cas, couper le courant et en chercher la raison. Après avoir éliminé la cause de ce mauvais fonctionnement, remettre l'appareil en circuit.**

**❹ Prise pour casque d'écoute (PHONES)**
Brancher un casque d'écoute sur cette prise.

**Remarque:**

- **Le raccordement d'un casque d'écoute ne coupe pas le son des haut-parleurs. Pour écouter uniquement le son provenant du casque d'écoute, placer les interrupteurs d'enceintes (SPEAKER) sur la position arrêt (OFF).**

**❺ Interrupteurs d'enceintes (SPEAKER)**
Appuyer sur ces interrupteurs pour mettre les enceintes en circuit. Quand ils sont en marche, les indicateurs bleus des boutons s'allument. Appuyer à nouveau pour couper le circuit.

**SYSTEM-1:** Appuyer pour écouter les haut-parleurs branchés aux bornes SYSTEM-1.
**SYSTEM-2:** Appuyer pour écouter les haut-parleurs branchés aux bornes SYSTEM-2.

Lorsque les deux sont en circuit, le son sera entendu des deux systèmes de haut-parleurs.

# SPECIFICATIONS

| | | |
|---|---|---|
| **Output power** | : | 160 watts per channel min. RMS, both channels driven into 8 ohms from 20 Hz to 20 kHz, with no more than 0.002 % total harmonic distortion |
| **Total harmonic distortion** | : | 0.002 % at 160 watts output (20 Hz – 20 kHz, 8 ohms) |
| **Intermodulation distortion** | : | 0.002 % (60 Hz : 7 kHz = 4 : 1) at 160 watts output, 8 ohms. |
| **Power band width** | : | 5 Hz – 100 kHz (0.02 % harmonic distortion, 8 ohms, IHF) |
| **Switching distortion** | : | 0 |
| **Transient intermodulation distortion** | : | 0 (LPF fc = 100 kHz) |
| **Frequency response** | : | DC to 300 kHz +0, -3 dB (DIRECT input, 8 ohms) |
| **Subsonic filter** | : | 16 Hz (-6 dB/oct) |
| **Input sensitivity/impedance** | : | 1 V/100 kohms |
| **Signal-to-noise ratio*** | : | 120 dB/100 dB/75 dB |
| **Damping factor** | : | 200 (1 kHz, 8 ohms) |
| **Dimensions** | : | 460 (W) x 203.5 (H) x 417.5 (D) mm 18-1/8 (W) x 8 (H) x 16-7/16 (D) |
| **Weight** | : | 28 kg (61.6 lbs) |

* IHF-A network, short-circuited/IHF A-202/DIN

*Design and specifications subject to change without notice.*

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# TECHNISCHE DATEN

| | | |
|---|---|---|
| **Ausgangsleistung** | : | 160 Watt pro Kanal min. eff., beide Kanäle mit 8 Ohm von 20 Hz bis 20 kHz betrieben mit nicht mehr als 0,002 % Klirrgrad |
| **Klirrgrad** | : | 0,002 % bei 160 Watt Ausgangsleistung. (20 Hz bis 20 kHz, 8 Ohm) |
| **Intermodulationsverzerrungen** | : | 0,002 % (60 Hz : 7 kHz = 4 : 1) bei 160 Watt Ausgangsleistung, 8 Ohm |
| **Leistungsbandbreite** | : | 5 Hz bis 100 kHz (0,02 % Klirrgrad, 8 Ohm, IHF) |
| **Schaltverzerrungen** | : | 0 |
| **Einschwing-Intermodulationsverzerrungen** | : | 0 (LPF fc = 100 kHz) |
| **Frequenzgang** | : | Gleichstrom bis 300 kHz +0 -3 dB (DIRECT-Eingang, 8 Ohm) |
| **Unterschallfilter** | : | 16 Hz (-6 dB/Okt.) |
| **Eingangs-Empfindlichkeit/Impedanz** | : | 1 V/100 kOhm |
| **Störspannungsabstand*** | : | 120 dB/100 dB/75 dB |
| **Dämpfungsfaktor** | : | 200 (1 kHz, 8 Ohm) |
| **Abmessungen** | : | 460 (B) x 203,5 (H) x 417,5 (T) mm |
| **Gewicht** | : | 28 kg |

* IHF A-Netzwerk, kurzgeschlossen/IHF A-202/DIN

*Technische Änderungen vorbehalten.*

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# CARACTERISTIQUES TECHNIQUES

| | | |
|---|---|---|
| **Puissance de sortie** | : | 160 watts par min. RMS, deux canaux en service sous 8 ohms de 20 Hz à 20 kHz avec moins de 0,002 % de distorsion harmonique totale |
| **Distorsion harmonique totale** | : | 0,002 % à une sortie de 160 watts (20 Hz – 20 kHz, 8 ohms) |
| **Distorsion d'intermodulation** | : | 0,002 % (60 Hz : 7 kHz = 4 : 1) à une sortie de 160 watts, 8 ohms |
| **Largeur de bande puissance** | : | 5 Hz – 100 Hz (Distorsion harmonique 0,02%, 8 ohms, IHF) |
| **Distorsion à la commutation** | : | 0 |
| **Distorsion d'intermodulation transitoire** | : | 0 (LPF 'Filtre passe-bas' fc = 100 kHz) |
| **Réponse en fréquence** | : | CC–300 kHz +0, -3 dB (Entrée DIRECTE, 8 ohms) |
| **Filtre subsonic** | : | 16 Hz (-6 dB/oct) |
| **Entrée de sensibilité/impédance** | : | 1 V/100 kohms |
| **Rapport signal/bruit*** | : | 120 dB/100 dB/75 dB |
| **Facteur d'amortissement** | : | 200 (1 kHz, 8 ohms) |
| **Dimensions** | : | 460 (L) x 203,5 (H) x 417,5 (P) mm |
| **Poids** | : | 28 kg |

* IHF-A, court-circuit/IHF A-202/DIN

*Présentation et caractéristiques modifiables sans préavis.*

## POWER SPECIFICATIONS

| Areas | Line Voltage & Frequency | Power Consumption |
|---|---|---|
| U.S.A. | AC 120 V, 60 Hz | 380 watts |
| CONTINENTAL EUROPE | AC 220 V∿, 50 Hz | 680 watts |
| U.K. | AC 240 V∿, 50 Hz | 680 watts |
| OTHER AREAS | AC 110/120/220/240 V∿ Selectable, 50/60 Hz | 680 watts |

## SPANNUNGSVERSORGUNG

| Länder | Netzspannung und Frequenz | Leistungsaufnahme |
|---|---|---|
| USA | Netz 120 V, 60 Hz | 380 Watt |
| EUROPA (KONTINENT) | Netz 220 V∿, 50 Hz | 680 Watt |
| ENGLAND | Netz 240 V∿, 50 Hz | 680 Watt |
| ANDERE LÄNDER | Netz 110/120/220/240 V∿ umschaltbar, 50/60 Hz | 680 Watt |

## SPECIFICATIONS D'ALIMENTATION

| Pays | Tension du secteur et fréquence | Consommation |
|---|---|---|
| ETATS-UNIS | CA 120 V, 60 Hz | 380 watts |
| EUROPE CONTINENTALE | CA 220 V∿, 50 Hz | 680 watts |
| ROYAUME-UNI | CA 240 V∿, 50 Hz | 680 watts |
| AUTRES PAYS | CA 110/120/220/240 V∿ Commutable, 50/60 Hz | 680 watts |

Vol. 7

# M-L10

# TECHNICAL MANUAL

# Contents


## Chapter 1 Basic Circuits

Page

1. Introduction ..... 2
2. Basic Circuit Configuration of Power Amplifier and Its Problems
   - 2-1 Basic Circuit Configuration ..... 2
   - 2-2 Problem of Power Supply ..... 3
   - 2-3 Voltage Amplifier Section ..... 3
   - 2-4 Relationship between Voltage Amplifier and Power Amplifier Stage ..... 3
   - 2-5 Problem of Power Stage ..... 4
   - 2-6 Problem when Speakers are connected ..... 4
3. Power Cascode Super-A Circuit
   - 3-1 Types of Power Cascode Circuits ..... 6
   - 3-2 Features of Power Cascode Super-A Circuit ..... 8
4. Other Features of M-L10
   - 4-1 Voltage Amplifier Stage ..... 9
   - 4-2 Protector Circuits ..... 10
   - 4-3 Large-Scale Power Meter ..... 10
5. Closer to the Musical Truth ..... 10

## Chapter 2 Operation of each Circuit

1. Voltage Amplifier Circuit ..... 12
2. Super-A Bias Circuit ..... 13
3. Power Amplifier Circuit ..... 14
4. Limiter and Protector Circuits ..... 15
5. Regulated Power Supply Circuit (for Predriver) ..... 16
6. Primary Power Source Circuit ..... 17

## Chapter 3 Hints on Servicing

Page

1. Caution when Powering the Unit after Repair ..... 18
2. How to Check Characteristics after Repair
   - 2-1 Re-check and Re-adjustment of Center Voltage ..... 18
   - 2-2 Re-adjustment of Idling Current ..... 19
   - 2-3 Level Adjustment of Power Meter ..... 19
   - 2-4 Signal Applying Test ..... 19
   - 2-5 Frequency Response ..... 20
   - 2-6 Check of Residual Noise and Hum Level ..... 20
   - 2-7 Capacitive Load Test ..... 20
   - 2-8 Running Test ..... 20
3. How to Locate the Defective Stage ..... 21
4. Hints on Other Checks ..... 24
5. Detailed Service Hints when Power Stage is Damaged ..... 24
6. How to Clean and Repair the Cabinet
   - 6-1 How to Clean ..... 28
   - 6-2 How to Repair ..... 28

# Chapter 1. Basic Circuits

## 1. Introduction

The attention in the present audio field is centered on "digital audio". The audio equipment developed recently always lays importance on "digital compatible" in preparation for the coming digital audio age.

Certainly, when audio equipment is digitized, the S/N ratio is improved, the dynamic range is widened and the distortion is reduced. Thus, high power and improved linearity are naturally required for amplifiers and speakers. Namely the dynamic range is extended more at upper level, and what is meant by "digital compatible" mostly seems to indicate the tendency of dynamic range extension at upper level.

However, the unforgettable matter here is the extension of the dynamic range at lower level rather than at upper level. Especially, it is easy to extend the dynamic range at upper level when depending on the quantity of audio material, while it is difficult at lower level because of various problems which cannot be solved by the improved S/N ratio alone.

The sound quality of the amplifier generally depends on the reproduction of this dynamic range determinatively.

In the digital audio, as the 16-bit system is superior to the 14-bit system, the effort to increase the number of bits is made to extend the dynamic range at lower level.

Our new laboratory series separate amplifiers, P-L10 (preamp) and M-L10 (power amp) are developed taking this point into account. The features of the resultant circuit are: application of the newly developed Gm processor to the P-L10; application of the power cascode super A circuit to the M-L10 in which the power amplifier is composed of all-stage cascode bootstrap circuit.

In this volume, we would like to introduce the M-L10 with an emphasis on the power cascode circuit.

## 2. Basic Circuit Configuration of Power Amplifier and Its Problems

### 2-1 Basic Circuit Configuration

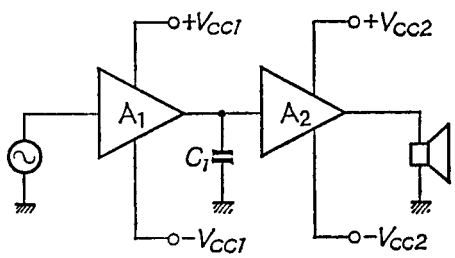



**Fig. 1 Basic circuit configuration of power amplifier**

**Fig. 1** shows the basic circuit configuration of the power amplifier. This configuration also applies to the pre-amp and op amp. Section $A_1$ mainly amplifies the voltage.

Section $A_2$, so-called the power stage, amplifies the current or converts the impedance.

## 2-2 Problem of Power Supply

The power supply ($\pm V_{CC1}$) to section $A_1$ normally uses a regulated power supply. The power supply to power stage $A_2$ ($\pm V_{CC2}$) is of large voltage so that it normally uses a non-regulated power supply. Therefore, as the supply voltage to power stage $A_2$ normally changes by more than 10 V with speakers connected, a circuit which the least possible change of voltage (taken to be noise or distortion) appears in the speakers is desirable. At a glance, it seems to solve this problem by making $\pm V_{CC2}$ constant. However, no matter how the supply voltage is stabilized, the voltage applied to the transistors at the power stage changes once a music signal enters the power stage. For power transistors, this change is equivalent to the change of the supply voltage.

## 2-3 Voltage Amplifier Section

When we developed the "super A" technology, we recommended the introduction of that cascode bootstrap circuit into the predriver stage which provides the greatest voltage amplitude for the voltage amplifier stage. We took notice of the low distortion property of the cascode circuit which is remarked by its high-frequency response before. Thus, the distortion rate is successfully improved by 20 dB or more. However, at present, the cascode circuit is commonly used in the predriver stage in high class amplifier. In view of the dynamic characteristic, the operating current is determined on obvious design guideline. As far as the amplifier design is concerned, the amplifier section is relatively less problematic.

## 2-4 Relationship between Volltage Amplifier and Power Amplifier Stage

The output of voltage amplifier stage $A_1$ is generally of constant current. The degree of constant current greatly differs for different outputs in the predriver stage; resistload, constant current or cascode output. Anyway, at higher frequencies, this output becomes a constant voltage because of phase compensation capacitor $C_1$. The problem lies in matching between this stage and power stage $A_2$, and the input impedance and dynamic characteristic of the power stage should be fully taken into account.

This is because as the emitter-follower is used in the power stage, the distortion generally seems to be low. However, the current and voltage vary so mush as to drive the speakers. Further, when the operation of the power amplifier is near class B operation, the situation is considerable different.

## 2-5 Problem of Power Stage

In the power stage, the voltage, current and junction temperature (heat generation) vary acutely so that the current amplification factor ($\beta$) of power transistors or the voltage between base and emitter ($V_{BE}$) changes with distortion. Normally, in the emitter-follower, only the distortion ($\Delta V_{BE}$) due to the exponential characteristic is noted (which occurs between Ⓑ and Ⓒ in **Fig. 2**). As the power stage is not driven by a constant voltage, the distortion between Ⓐ and Ⓑ due to the non-linear portion of change of the base current ($i_B$) caused by $\beta$ change cannot be ignored.
These distortions are prevented as follows:
$\Delta V_{BE}$ can be eliminated by:

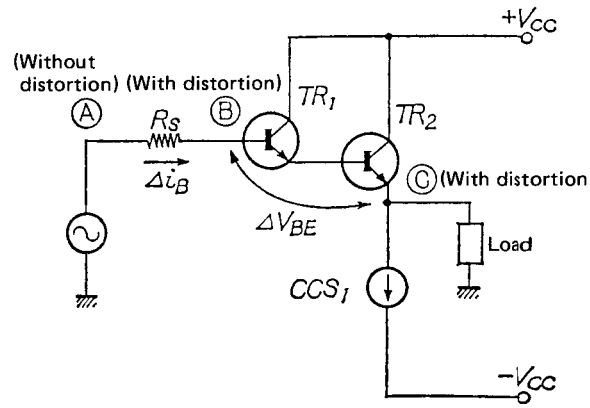



**Fig. 2 Distortion in emitter-follower**

(1) Using the sufficiently small non-linear portion of the dynamic resistance between base and emitter by adopting a classic class A operation.
(2) Using the bias circuit (e.g. super A bias circuit) to correct the exponential characteristic between base and emitter.

The distortion due to $\beta$ change can be eliminated by:

(3) Operating the power transistors by cascode bootstraping, concurrently assuring the sufficient current linearity.
(4) Driving the power transistors in a constant voltage (when Rs=0, no voltage appears between (A) and (B)).

## 2-6 Problem when Speakers are connected

The amplifier performance is usually estimated by using a pure load resistance of 8 ohms or 4 ohms to ensure its signal reproductivity. This is also true of the specifications. Namely, despite that speakers must be connected instead of the pure resistance to reproduce sound in practice there has never been an amplifier which shows the specifications when speakers are connected.
Thus, the characteristics when speakers are connected are guessed from the characteristics when an 8-ohm or a 4-ohm resistor is connected.
In a word, at present, to reproduce the sound in accordance with the measurement data, some attempts have been made.

However, the standard method has not yet been established. The impedance characteristic of speaker is necessarily divided into capacitive and inductive portions, wherein the operation of the amplifier is considerably different from that when a pure resistance is connected. This should be fully considered.

For example, when the voltage change between collector and emitter ($V_{CE}$) of the power transistor at the output stage of an ordinary pure capacitive SEPP is compared with the change of the collector current ($I_C$) as shown in **photos 1** and **2.**

**Photo 1** shows the case of using an 8-ohm pure resistance and **photo 2** shows the case of using a bass-reflex type speaker with a nominal impedance of 8 ohms. These two photos represent the same portion of the music signal for about 1 second.

Their respective operating traces are obviously different. This difference indicates not only the difference of distortion due to the difference of $\beta$ change depending on the voltage and current but also the difference of thermal distortion due to the difference of the moment-by-moment heat generation change of each transistor.

Fig. 3 shows the momentary heat generation change of power transistors at an input of sinewave.

Curve A represents the change against a pure resistance load and curves B and C shows the changes against load impedance with phase shift though they have the same absolute value.

The power cascode super A circuit has been developed with these points taken into account.

Methods (2) and (3) mentioned previously are used against the distortion. At the same time, the operating characteristic change due to the load impedance is eliminated by a merit of method (3).

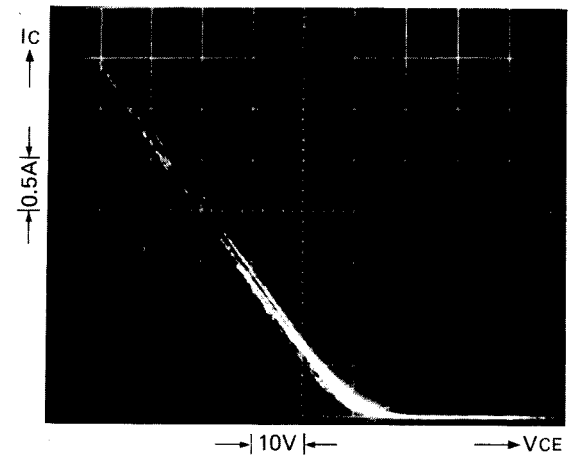



**Photo 1** Power transistor $V_{CE}$-$I_C$ characteristic when pure resistance load of 8-ohms is connected.

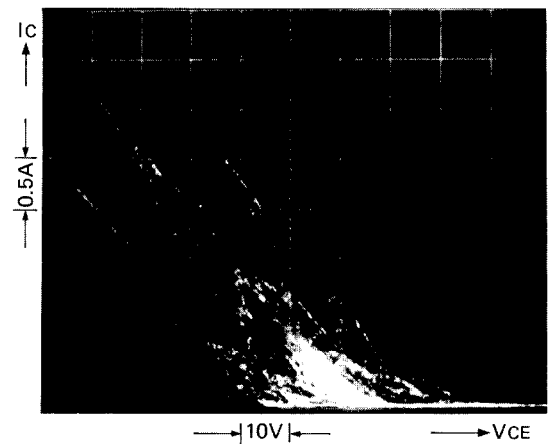



**Photo 2** Power transistor $V_{CE}$-$I_C$ characteristic when bass-reflex speakers are connected.

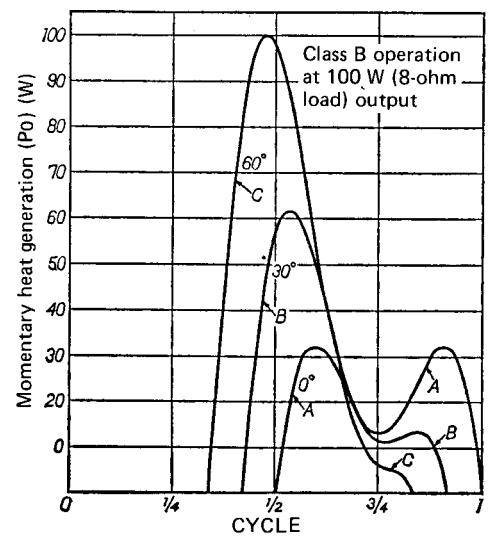



**Fig. 3 Comparison between momentary collector losses**

# 3. Power Cascode Super-A Circuit

## 3-1 Types of Power Cascode Circuits

(1) Cascode circuit using two separate resistors
This system is used when high dielectric strength power transistors are not available.
Its basic circuit is shown in **Fig. 4**. The advantage of this circuit lies only in doubled dielectric strength; no other characteristics can not be improved. This circuit is used in some overseas power amplifiers.

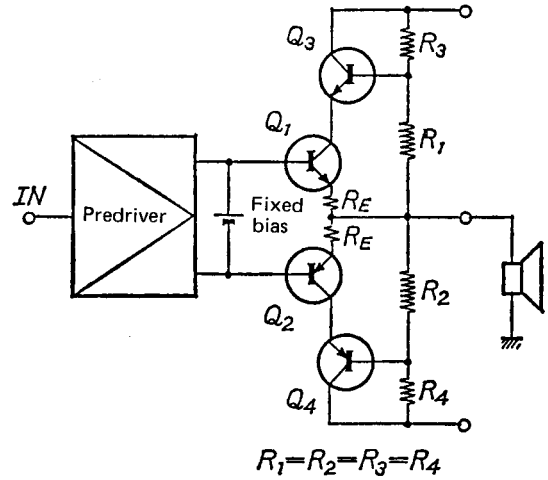



**Fig. 4 Cascode circuit using two separate resistors**

(2) Feedback bootstrap cascode circuit
**Fig. 5** shows a feedback bootstrap cascode circuit which is not confined to a power stage but is generally used in small signal circuits. In a small signal circuit, a sufficient performance can be obtained. However, in a power stage, some problems are present.
Namely, the voltage drop due to $R_E$ results in change of $V_{CE}$ in $Q_1$ and $Q_2$.
Further, as the control voltages of $Q_3$ and $Q_4$ are extracted from the emitters of $Q_1$ and $Q_2$, the phase delay between base and emitter in $Q_1$ and $Q_2$ is noticeable in cases of power transistors (this is negligible in small signal transistors), resulting in degraded high-frequency response.
When the control voltages of $Q_3$ and $Q_4$ are extracted from the bases of $Q_1$ and $Q_2$, $V_{CE}$ in the fixed bias class B (AB) operation lowers during half cycle of cut-off frequency so that oscillation occurs.

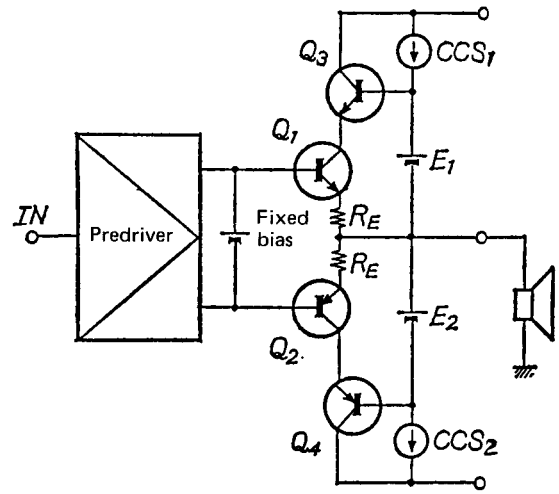



**Fig. 5 Cascode circuit using feedback bootstrap**

(3) Power cascode super A circuit (super A + feed forward system cascode circuit)

**Fig. 6** shows a basic configuration of the power cascode super A circuit.

In combination with the super A bias circuit, the drawbacks in item (2) are all solved so that a good characteristic is obtained. Namely, as the control voltages of Q3 and Q4 are extracted from the bases of Q1 and Q2 (feed forward), high-frequency response is desirable.

In addition, owing to the super A bias circuit, no cut-off action occurs, thus permitting stable operation.

Amplifier A is a buffer to prevent interference between Q3/Q4 and the signal system. In practical circuits, it consists of a bootstrap type emitter-follower circuit.

Since E1 and E2 are 4.7 V Zener diodes, Q1 and Q2 operate on a constant voltage of about 5 V in which current alone varies.

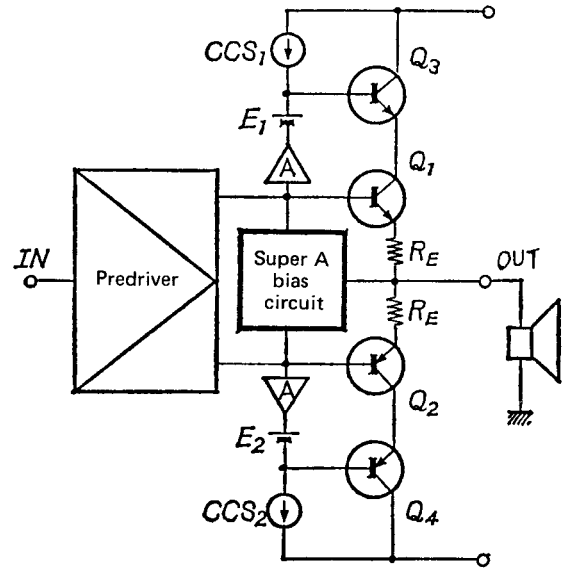



**Fig. 6 Power cascode super A circuit**

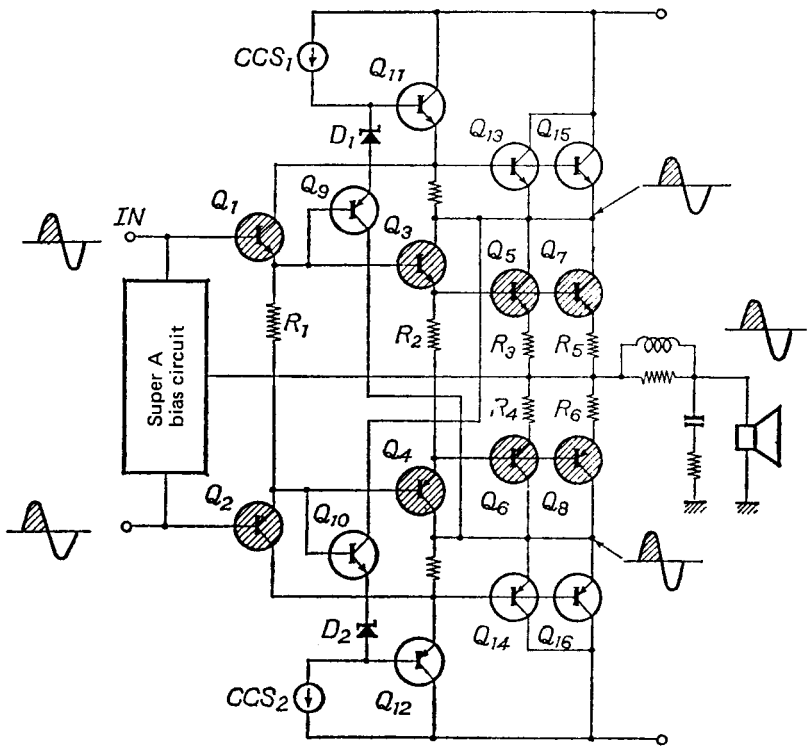



**Fig. 7 Power cascode super A circuit in M-L10**

**Fig. 7** shows the power cascode circuit used in M-L10.

As known from this diagram, this is basically a parallel-push-pull output triple Darlington power stage(consisting of transistors shaded with slanted lines). The operating voltage waveform at each section at an input of sinewave is also shown in **Fig. 7.**

## 3-2 Features of Power Cascode Super-A Circuit

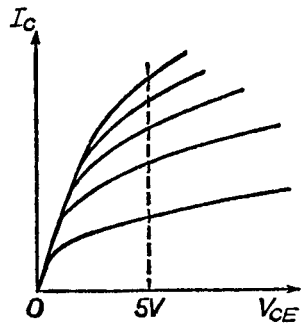



Fig. 8 I/O characteristic of ordinary high-dielectric-strength power transistor

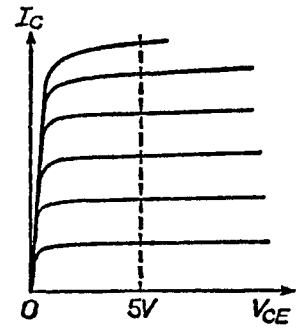



Fig. 9 I/O characteristic of low-saturation-voltage power transistor

(1) Free from the effect of supply voltage change
The supply voltage change is absorbed by Q3 and Q4 (see **Fig. 6**) so that Q1 and Q2 which determine the output characteristic are free from the effect of the supply voltage change.

In combination with the super A bias circuit, Q1 and Q2 operate on a constant VCE of about 5 V in which current alone varies. This can be obtained with speaker or pure resistance load.

(2) Characteristic with pure resistance load is also assured when speaker load is connected.
From another viewpoint of feature (1), the

As Q1 and Q2 operate on a constant voltage at all times, as long as the current linearity is assured within the required output current range, a desirable performance can be obtained whatever the load impedance.
However, as VCE is a low voltage of about 5 V, using ordinary power transistors results in selecting an operating area with poor linearity (see **Fig. 8**).
In M-L10, a low-voltage saturation type power transistor which is also developed for this circuit (which does not provide a high dielectric strength but whose current linearity is superb even when operated on a low voltage. For example, even when VCE is 2 V, linearity is assured up to 10 A or more. This transistor is entirely devoted to current amplification whose characteristic is inherent to a transistor) is used in a parallel-push-pull configuration.
For this reason, a linear relationship between current and $\beta$ is assured up to 20 A or more.
As a result of this, even with a low impedance load, the distortion does not increase. With a 4-ohm load, the distortion rate is specified at

phase shift of voltage and current (see **photo 2**) because of the frequency characteristic against the load impedance is absorbed by Q3 and Q4.

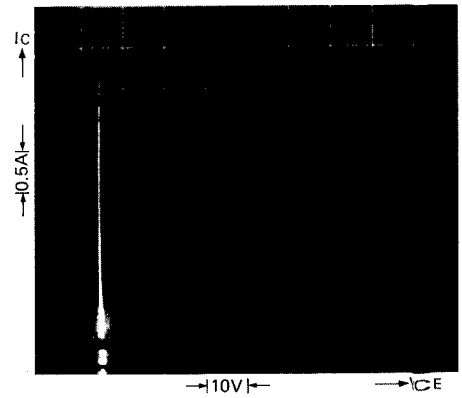



**Photo 3** Operating state of Q1

0.002 % or less, the same percentage as with an 8-ohm load.
Let us compare an ordinary high dielectric strength power transistor with a low voltage saturation power transistor in respect to I/O characteristic as shown in **Figs 8** and 9.
When the operation of Q1 is photographed in the same conditions as in **photos 1** and **2**, it is as shown in **photo 3** whatever the load impedance, though the current value is different. Thereby, the afore-said fact is proved.

(3) Desirable stability of idling current
This relates to feature (1). A large change of the supply voltage does not lead to change of the idling current. This is a great feature of stable operating point. When this circuit is compared with an ordinary circuit, it is as shown in **Fig. 10**. Practically, even when the voltage at the AC primary side drops from 100 % to 50 %, M-L10 operates normally with no change of the distortion rate except that the maximum rated output drops from 160 W to 40 W, thus providing high stability.

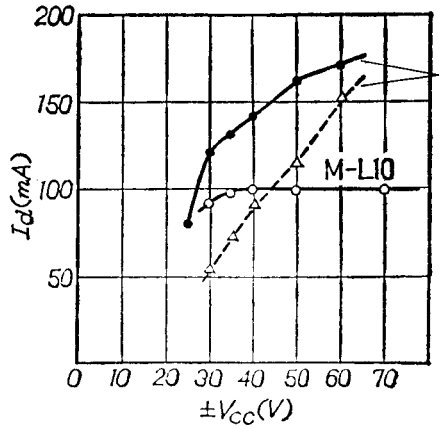



**Fig. 10 Comparison between idling current changes due to supply voltage change**

The main cause of the idling current change lies in the supply voltage change, $P_D$ change, junction temperature change and $V_{BE}$ change. SVRR in the predriver stage also relates to this. In M-L10, as $V_{CE}$ in $Q_1$ and $Q_2$ is constant even when the supply voltage varies, $P_D$ does not change at all.
As SVRR in the predriver stage is sufficiently good, the idling current is extremely stable. This also leads to smaller change of momentary heat generation of $Q_1$ and $Q_2$ due to varying magnitude of the output. This is illustrated in **Fig. 11**. This does not mean that the heat generation of the amplifier is decreased but means that the heat generation in $Q_3$ and $Q_4$ changes as shown in **Fig. 3** independent of the output characteristic.
In the long run, the supply voltage change or the heat generation change is all absorbed by $Q_3$ and $Q_4$ just as in shock absorbers so that $Q_1$ and $Q_2$ can operate very stably.

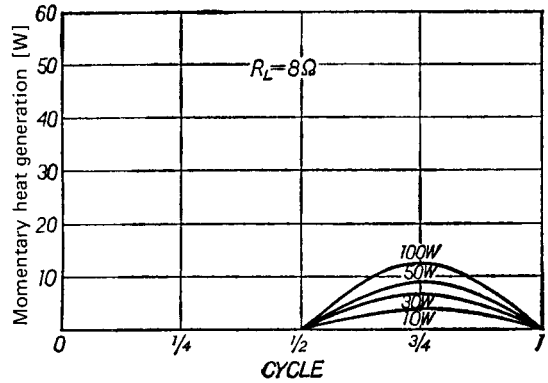



**Fig. 11 Output vs momentary collector loss**

# 4. Other Features of M-L10

## 4-1 Voltage Amplifier Stage

In addition to the 2-stage differential circuit which is a base of the amplifying circuit and is taken to be an ultimate configuration, the cascode bootstrap circuit and the first stage automatic balance type active load are added to increase SVRR, thereby amplifying the input signal alone. **Fig. 12** shows the basic circuit configuration.
A pure NFB circuit with a base of 2-pole 1-lead compensation is adopted for the phase compensation.

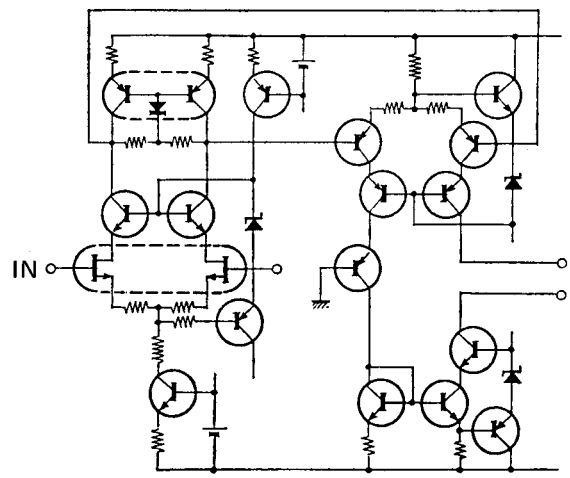



**Fig. 12 Voltage amplifying stage in M-L10**

## 4-2 Protector Circuits

(1) Protection by detecting the center voltage
When the DC voltage accidentally exceeds ±3 V for some reason or other in such cases as DC voltage is applied to the input, the speaker relay is released to prevent damage to the speakers.

(2) Protection against load shorting
When the speaker output terminals are shorted for some reason or other, the speaker relay is released to prevent damage to the amplifier. The release time of the relay is given in two steps: 6 seconds and about 30 seconds according to the output state.

(3) Power limiter circuit
The power limiter circuit is provided so that the maximum rated output is 200 W at 4 ohms. This is not a current limiter but a pure voltage limiter in which stress is put on sound quality.

## 4-3 Large-Scale Power Meter

This is a logarithmic scale type power level meter capable of indicating from minute output to maximum power without selecting the scale range.

In its electric circuit, the attack/recovery time is set so that the meter deflection exactly follows the musical intonation.

# 5. Closer to the Musical Truth

So far, the hardware is described with stress upon the power cascode super A circuit. After all, an amplifier is nothing more than a device for listening to music. The explanation of the hardware is powerless in front of music no matter how well it is made. Therefore, sense of vision, sense of touch and harmony with surroudings should be considered, not to mention sound (sense of hearing), so that "mind of audio" or "heart of music" are satisfied at high grade. The separate amplifier is expected to fulfill this so-called "high musical sensibility".
From such points, P-L10 and M-L10 are fruited as a result of stressing the features of the separate amplifier from viewpoint of "musical sensibility".

Concerning the latest technology, its employment is not shown off on the mechanical appearance intentionally but is secretly indicated on the orthodox panel design of the real rosewood-trimmed cabinet to which our traditional wood working technology is applied.
As described here, the design lays importance on the heart of music.
"Closer to the Musical Truth" is our design concept towards all over the world.

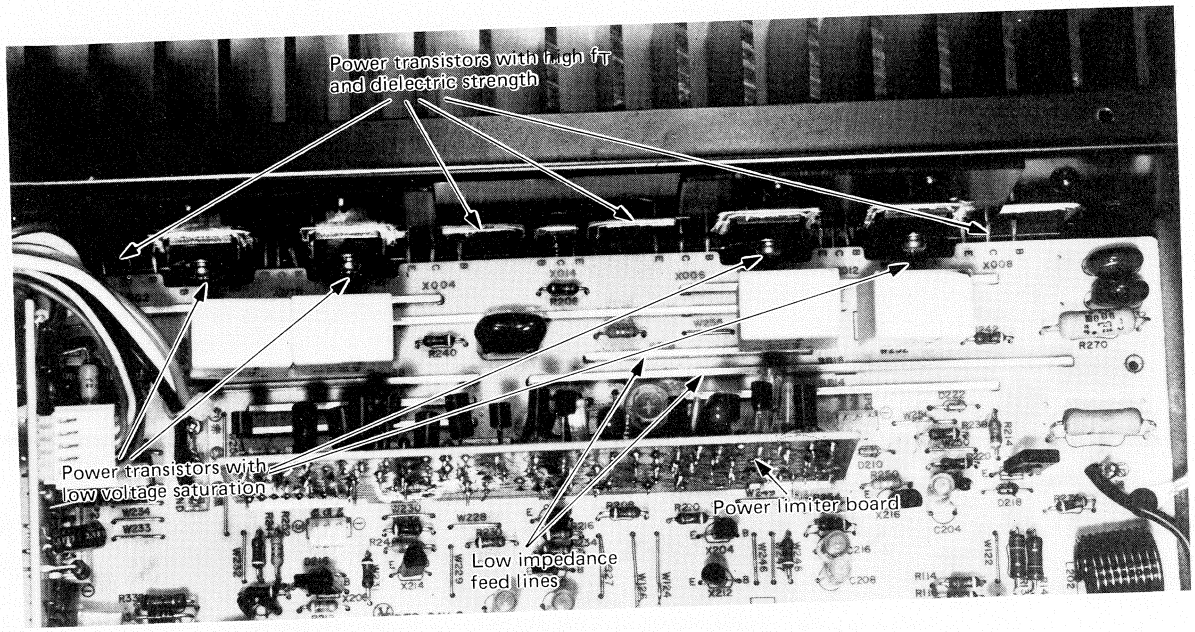

Power transistors with high fT and dielectric strength
Power transistors with low voltage saturation
Low impedance feed lines
Power limiter board

**Photo 4** Power cascode super A output stage in M-L10.

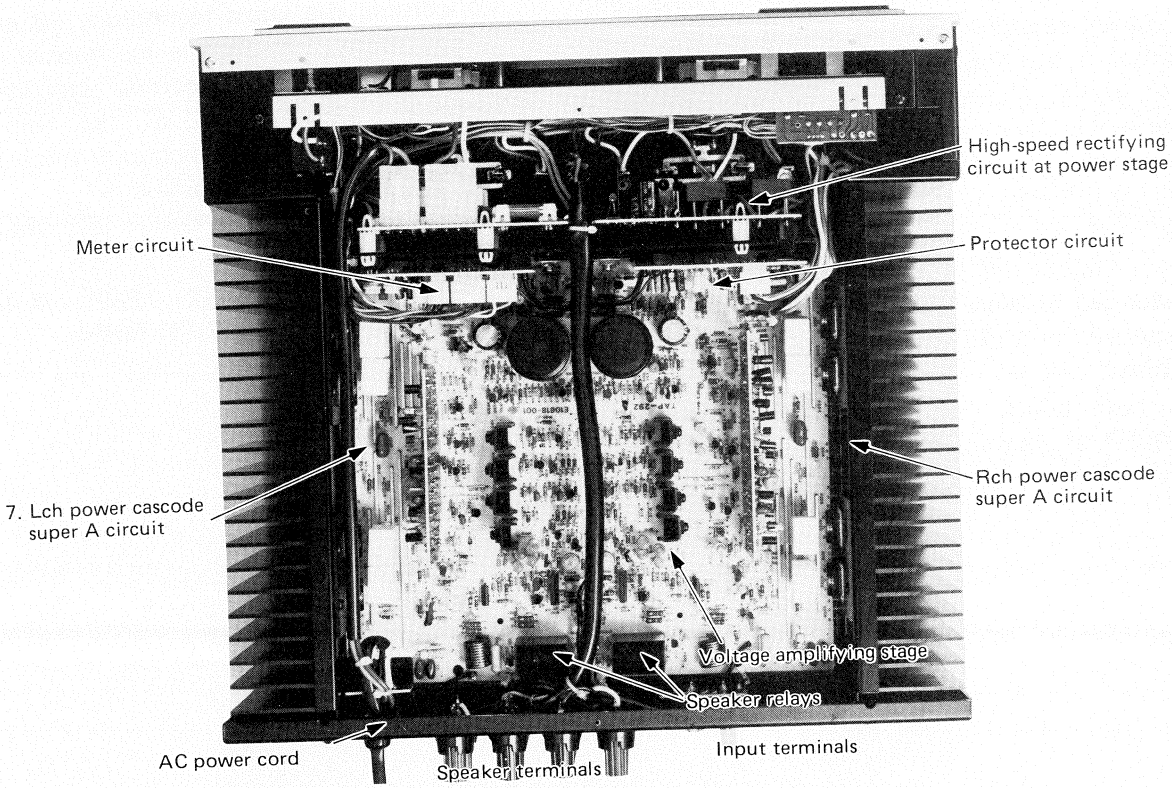



**Photo 5** Rear view of parts locations in M-L10

# Chapter 2. Operation of each Circuit

## 1. Voltage Amplifier Circuit

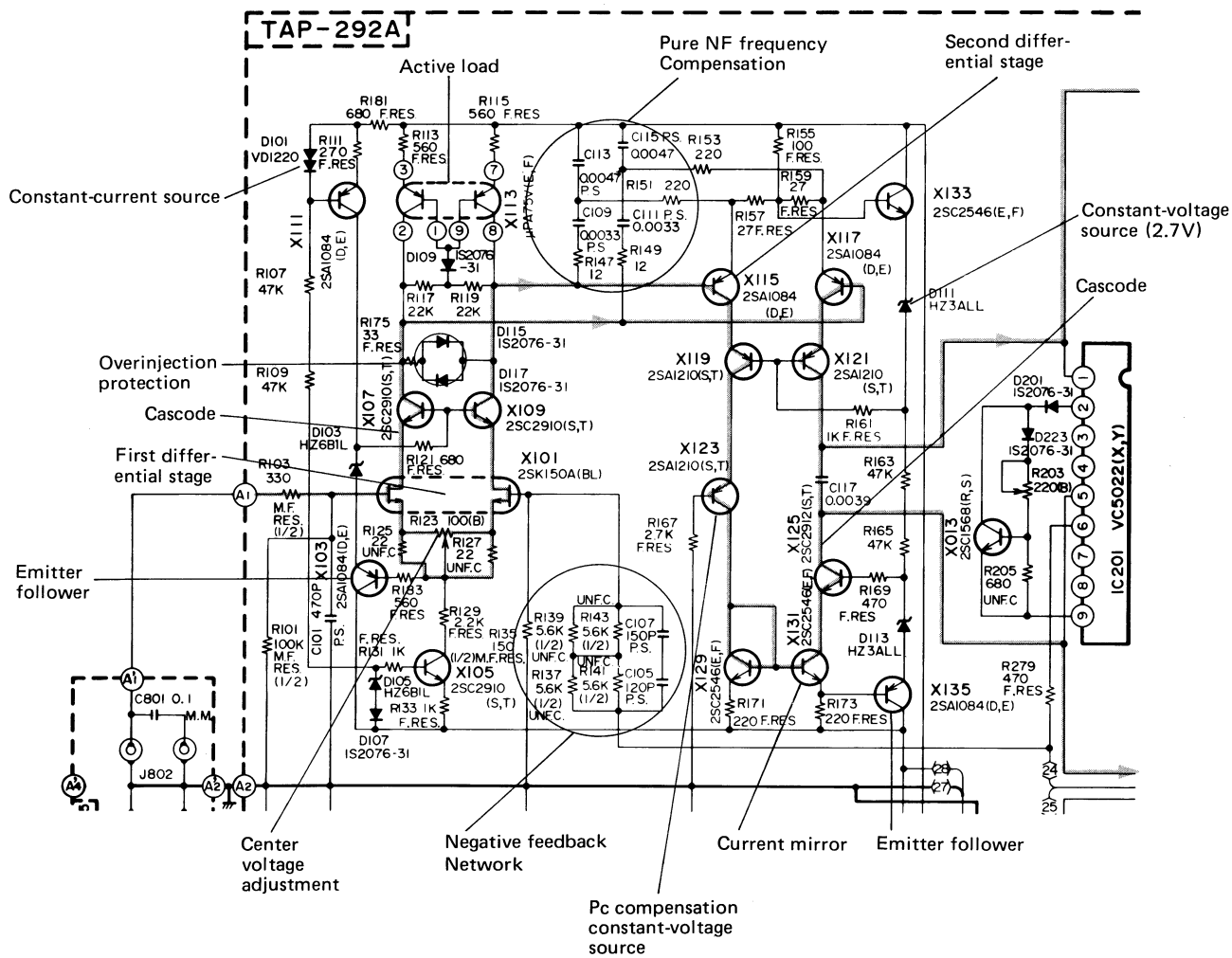



**Fig. 13 Voltage amplifier circuit**

(1) This circuit voltage-amplifies the input signal to supply it to the power amplifying stage.
This circuit is basically configured of two differential stages, each with a cascode bootstrap circuit.

(2) The first differential stage is formed of a combination of a differential circuit consisting of dual low-noise FET 2SK150A (X101) and constant-current source X105 with a cascode bootstrap circuit consisting of X107, X109, X103, D103 and X111. As a result, X101 operates on a constant source-drain voltage of about 5.6 V, thus permitting improved characteristics.
Dual transistor X113 is the active load which takes advantage of the large internal impedance of the constant-current source circuit to work as an AC load in the first differential stage.

(3) The second differential stage is formed of a combination of a differential circuit of X115 and X117 with a cascode bootstrap circuit of X119, X121, X133 and D111.
One of push-pull outputs is extracted from the collector of X121. The other, extracted from the collector of X119, is phase-inverted by the current mirror circuit consisting of X129 and X131, and is extracted from the output of the cascode bootstrap circuit (X125, X135, D113) for this current mirror circuit.
X123, a constant-voltage source, compensates the collector loss of X119 for thermal balance.
Thus, the collector losses of X119, X121, X123 and X125 are each about 700 mW or less.

(4) The CR network of C109-116 and R147-154, the pure NF frequency compensation, determines the 2-pole 1-lead open-loop characteristic in combination with C201-208 in the power stage, thus permitting wider negative feddback bandwith.

(A 1-lead circuit is formed by applying a positive feedback across R151-154 to the mid-points of series-connected capacitors. At the same time, C109-112 undergo bootstrapping to improve the slew rate.

## 2. Super-A Bias Circuit

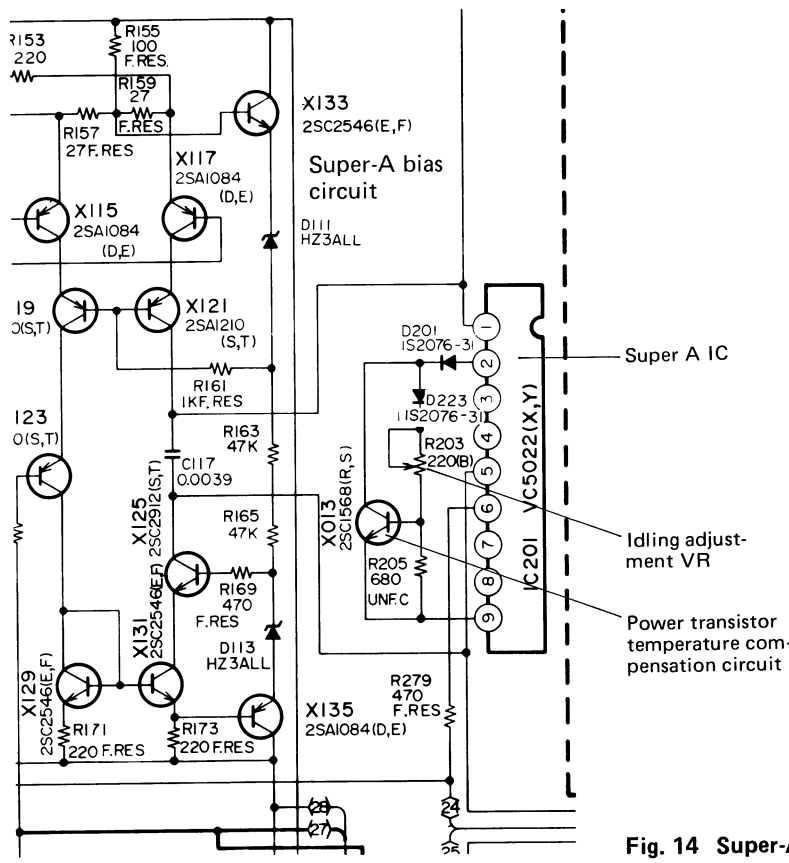



Fig. 14 Super-A bias circuit

(1) This circuit permits high-efficiency class-A operation by joint use of super-A IC and the power stage.

(2) X013 in combination with R203, R205 and D223 forms a constant voltage circuit which compensates the power transistors for temperature change concurrently with the adjustment of the idling. (X013 is mounted on the main heat sink.)

# 3. Power Amplifier Circuit

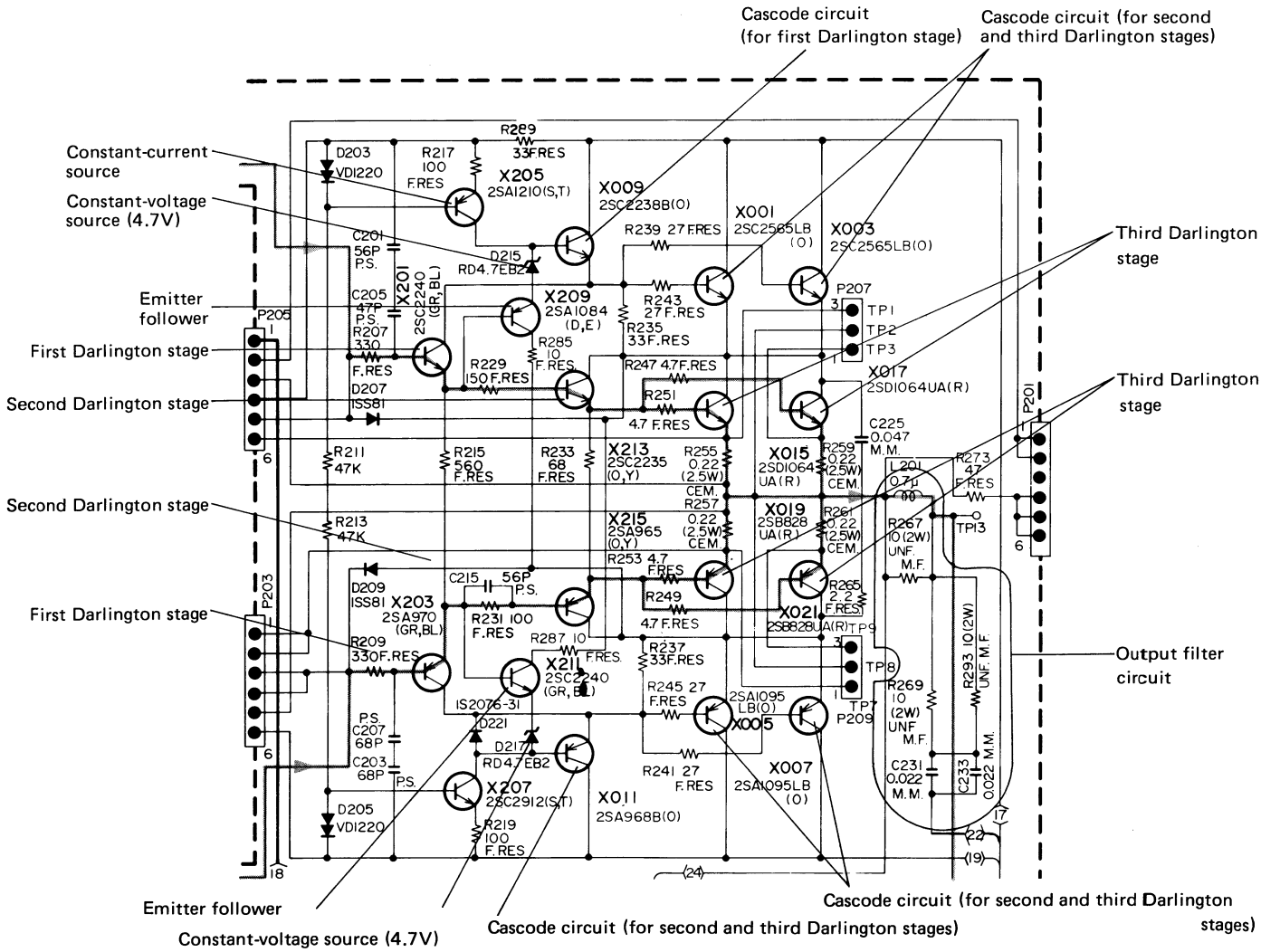



**Fig. 15 Power amplifier circuit**

(1) The basic circuit consists of a parallel push-pull triple Darlington circuit in all-stage cascode bootstrap system.

(2) The signal path is formed of X201 → X213 → X015//X017 (negative side, X203 → X215 → X019//X021).
This portion corresponds to that of the conventional power stage to determine the output characteristic of the power stage.
In the M-L10, a newly added power cascode circuit of X209, X205, X009, X001 and X003 (negative side, X211, X207, X011, X005 and X007) forms the cascode bootstrap circuit to improve characteristics.

(3) The power cascode circuit extracts the cascode signal from the emitter of X201 by emitter follower X209 to drive its other circuit elements of X009, X001 and X003 via the constant voltage circuit (4.7 V Zener diode).
X205 is a constant current source to D215.
X009, the cascode transistor for X201 in the first Darlington stage, drives X001 and X003 in the final cascode stage. X001 and X003 which are the cascode transistors common to the second and third Darlington stages, forms a parallel push-pull circuit; these are large capacity power transistors with Pc=150 W.
As a result, the collector-emitter voltages of X201, X213, X015 and X017, which determine the output characteristic of the amplifier, become constant at 5 V. On the other hand, voltage change is absorbed by the cascode transistors.

(4) D207 and D209 are clipper diodes to prevent overdrive.

# 4. Limiter and Protector Circuits

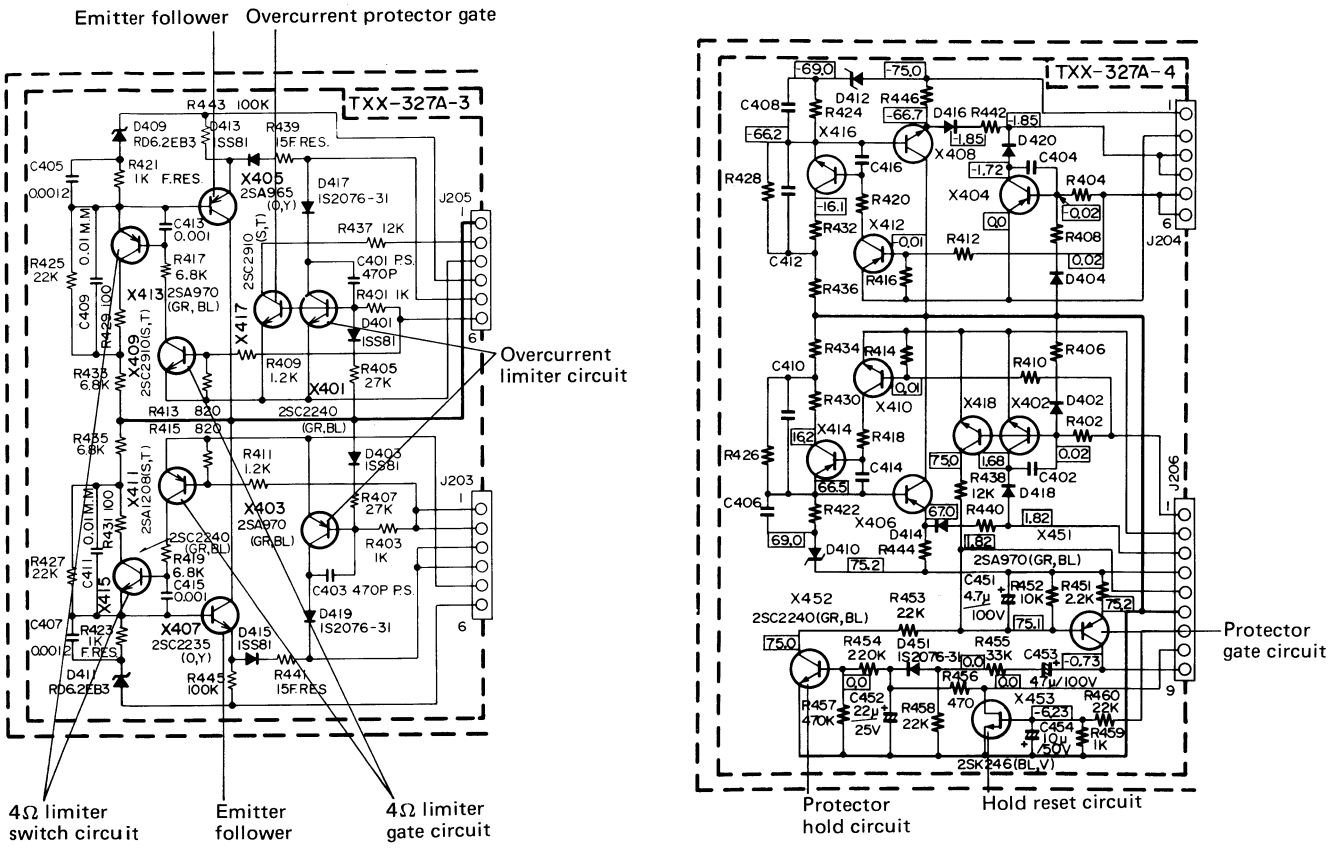



**Fig. 16 Limiter and protector**

(1) TXX-327-3 as well as -4 consists of an overcurrent limiter circuit, a 4 Ω limiter circuit and a part of protector detection circuit.

(2) Overcurrent limiter circuit:
Abnormal current due to load shorting, oscillation, etc. is detected and controlled by the impedance detection type gate circuit consisting of R401, R405 and X401 to limit the output current in the power stage. X417 actuates the protector circuit in synchronism with the overcurrent limiter circuit to turn off the speaker relay.

(3) 4 Ω limiter circuit:
An output of more than 200 W/4 Ω turns on the current detection type gate circuit consisting of R409, R413 and X409 to turn on switching circuit of X413.
The source voltage divider circuit consisting of D409, R421, R425 and R433 is designed in which the voltage at point A (VA) works to control the output voltage more than 200 W/4 Ω when X413 is on.
Therefore, the output voltage of the power stage which exceeds 200 W/4 Ω is clamped to less than VA via D413 and X405 so that the output power is controlled.
Emitter follower X405 is provided for impedance conversion at point A.

(4) The protector gate circuit (X451), incorporated only in TXX-327A-4, turns on when either overcurrent detection gate X417 or X418 operates, thereby raising the gate voltage at pin 1 of protector IC TA7317P to turn off the speaker relay.
The protector hold circuit is designed to automatically set the reset time of the protector to about 6 to 20 sec depending on the degree of the abnormality for more complete protection of the power stage. This operation is controlled by the time constant circuit of C453, R455, R458, D451, C452, R454 and R457 which detects the number of operations of protector gate X451 to hold the protector by applying the positive feedback to the base of X451.
FET X453 is used to reset the hold circuit when power is applied again even when the hold circuit is in operation.

# 5. Regulated Power Supply Circuit (for Predriver)

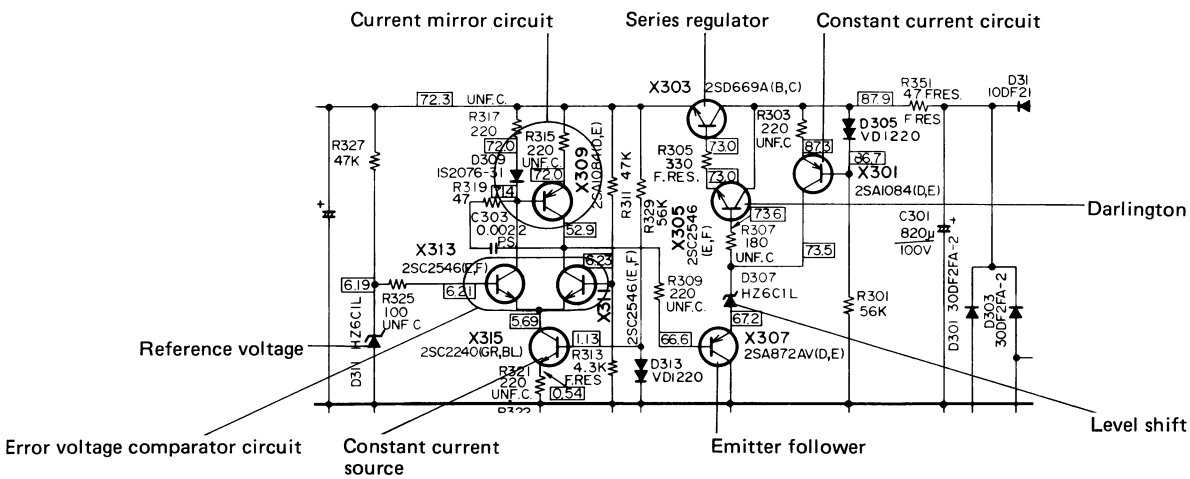



**Fig. 17 Regulated Power Supply circuit (for predriver)**

The error voltage comparator section is composed of the differential circuit with carrent mirror circuit consisting of X311, X313, X315 and X309. This section compares the output feedback voltage determined by R311 and R313 with the reference voltage at D311, amplifies it and controls the Darlington connected series requlator section of X305 and X303 via emitter follower X307.

# 6. Primary Power Source Circuit

The inrush resistors (R701 and R702) in the inrush protection circuit use two parallel-connected large-capacity cement resistors (6.8 Ω, 10 W) with a total of 20 W to prevent damage.
The inrush relay drive circuit is constructed in constant-current drive configuration (X701) so that the relay is actuated at 30 % of AC and is kept on against a reduced voltage down to 10 % of AC. This superb operating characteristic against AC voltage change helps to prevent damage to the inrush resistors.

## Bootstrap Cascode Circuit

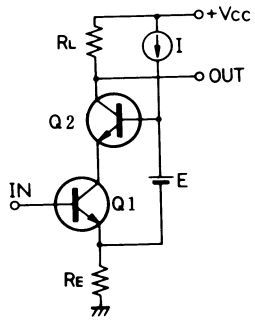



Fig. 18 Bootstrap cascode circuit

This diagram shows an example using a bootstrap technique, which allows a variation in emitter voltage of $Q_1$ to change the collector voltage in the same amplitude in synchronism with the emitter voltage variation. Thus, $V_{CE}$ is fixed at a constant voltage (=E), eliminating the occurrence of $\Delta V_{CE}$ distortion (due to nonlinear change of $\beta$ which depends on $V_{CE}$) and $\Delta$ Cob distortion (due to nonlinear change of Cob). Further, Cob can be regarded to be far smaller than the practical value.
Therefore, when the variation in $V_{CB}$ is zero, Cob is equivalent to zero.

# Chapter 3. Hints on Servicing

## 1. Caution when Powering the Unit after Repair

Instantaneous application of 100 % of AC may cause damage to power transistors again uless the unit is repaired completely.
For powering the unit, gradually increase the AC voltage with variac referring to the following procedure.

(1) Make sure that no lead of power capacitors (C1-C4, C301, C302, C307 and C308) is not shorted.
(2) First, keep the indling adjustment VRs (R203 and R204) turned fully counterclockwise. (bias: zero)
(3) Observing the idling current at the power stage, gradually increase the AC voltage with variac.
    * For checking the idling current, refer to "2. How to check characteristics after repair".
(4) With a defect which may lead to damage to the power stage, the idling current starts to flow at less than 30 % of AC voltage.
    In this case, do not increase this AC voltage, and follow the checking procedure below.
(5) With no defect, the inrush relay turns on at about 30 % of AC and the speaker relay at about 80 % of AC voltage. Even when the voltage is applied up to 100 % of AC voltage, the idling current observed on the oscilla-scope remains zero.
(6) Next, turn the adjustment VR to make sure the idling current can be varied. (0 mA to 400 mA)

Note: The voltage range of the oscilloscope while observing the idling current should be set to 50 mV/div. (≒200 mA/div.).

## 2. How to Check Characteristics after Repair

When no abnormal current is at the power stage and the power application is completed, be sure to check the following items:

### 2-1 Re-check and Re-adjustment of Center Voltage

| P.C. Board name | Connection point (test point No.) | Adjustment point (VR No.) | Setting voltage | Remarks |
|---|---|---|---|---|
| Driver amp P.C. board (TAP-292) | TP13-GND | R123 | 0 ± 5 mV | Lch |
| | TP14-GND | R124 | 0 ± 5 mV | Rch |

• GND: Negative SPEAKER terminal

## 2-2 Re-adjustment of Idling Current

Before powering, keep VR R203 and R204 turned fully counterclockwise, then adjust them after 1 minute from power-on.

| Board name | Connection point (test point No.) | Adjustment point (VR No.) | Setting voltage | Remarks |
|---|---|---|---|---|
| Driver amp P.C. board (TAP-292) | TP13-TP1<br>TP13-TP3<br>TP13-TP7<br>TP13-TP9 | R203 | 8-12 mV (10mV center) For idling current, 45 mA center | Lch |
| | TP14-TP4<br>TP14-TP6<br>TP14-TP10<br>TP-14-TP12 | R204 | 8-12 mV (10 mV center) For idling current, 45 mA center | Rch |

Note: When the unit is cool right after power-on, the setting idling voltage is small (5-10 mV), while as the unit gets warm, it increases and about 20 minutes later becomes stable (18-26 mV). Therefore, after 1 minute from power-on, adjust to 8-12 mV (10 mV center), then make sure the setting idling voltage is 18-26 mV when the idling become stable (about 20 minutes later).

## 2-3 Level Adjustment of Power Meter

Adjustment procedure

1. Make sure that the pointer of the meter reads 0 when power is off. When the pointer is away from 0, adjust it to the proper position.
2. Apply a signal of 1 kHz from the input terminal (SUBSONIC), then adjust the input signal level so that an output of 20 V appears at the SPEAKER terminals.
3. At this time, adjust R505 (Lch) and R506 (Rch) so that the pointer reads -5 dB (about 50 W).
4. Next, turn down the input signal by 20 dB and make sure that the pointer reads -25 ± 2 dB.

## 2-4 Signal Applying Test

a. With no dummy load, apply a 20 kHz sinewave. A normal sinewave should be obtained and a clear clipped waveform of about 70 Vo-p output should be obtained with no oscillation at clipped portion as shown in **Fig. 19.**

b. Next, connect an 8 Ω dummy load, then apply the same sinewave. The same waveform as with no load should be obtained.
However, the clipping level will be about 60 Vo-p. (Using 100 % of AC voltage)

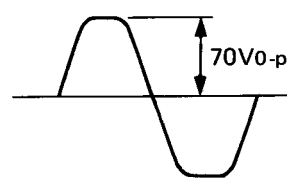



**Fig. 19**

## 2-5 Frequency Response

Connect an 8 Ω dummy load, and measure at an output level of about 1 V. A frequency response of 180 kHz -3 dB should be obtained when the output impedance of an oscillator (or attenuator) is 600 Ω.

## 2-6 Check of Residual Noise and Hum Level

This should be less than 0.2 Vrms at the output 8 Ω dummy load termination with the input shorted.

## 2-7 Capacitive Load Test

This checks the oscillation allowance. Be sure to perform this test. Do not connect an 8 Ω dummy load (because the test is more severe with no load).

a. Connect test capacitors to the SPEAKER terminals. (Both channels tested at the same time.)
   Connect three types of capacitors, about 0.001 μF, 0.01 μF and 0.1 μF.
   (Withstand voltage : more than 100 V)
b. Apply a 20 kHz sinewave. No oscillation should occur at the clipping point as in item (3).
   Since this load is capacitive, slight ringing at the clipping point does not matter. (**Fig. 20-A** shows a desirable example and **Fig. 20-B** an undesirable example.)
c. With a square wave generator, more accurate checking is possible.
   Apply a 10 kHz square wave. Even when rining occurs, it is permissible when it converges within 50 % of the half cycle.

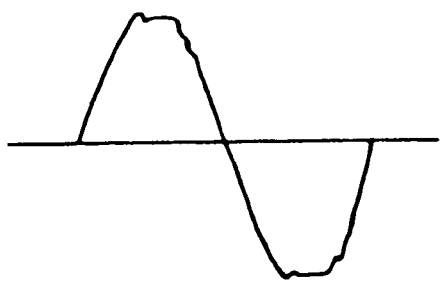


Fig. 20-A

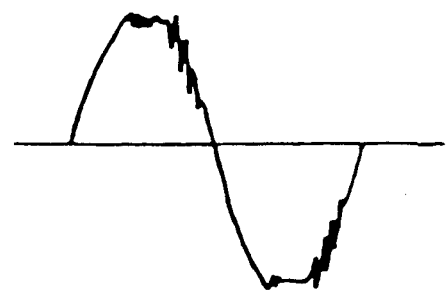


Fig. 20-B

## 2-8 Running Test

It is desirable to run the unit for half a day before shipment.

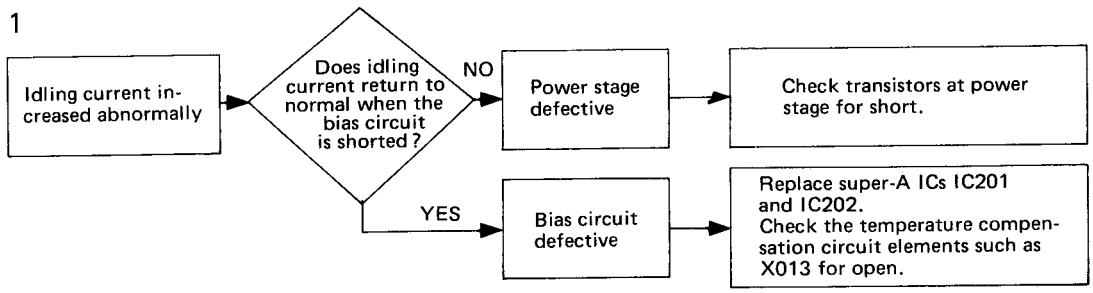
- Load: 4 Ω dummy
- Signal: Apply an FM music signal, then observe the output level on an oscilloscope, and set it to a level just before clipping at the peak level.

* When the foregoing items are met, the unit is judged normal.

# 3. How to Locate the Defective Stage

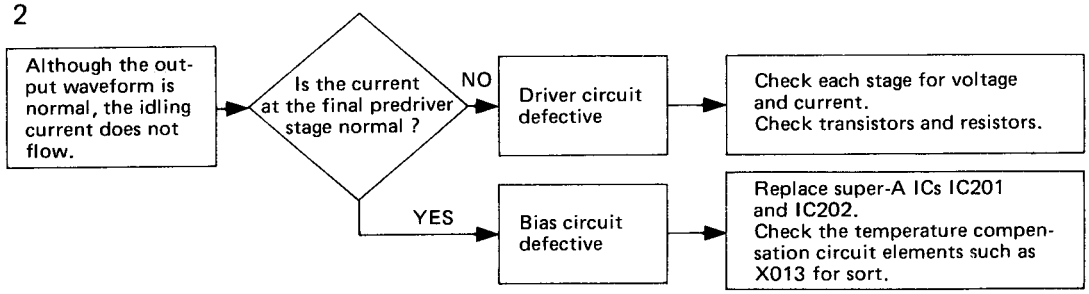
For symptoms whose causes are difficult to find out,refer to the following flowcharts:

Symptom 1


Idling current increased abnormally
Does idling current return to normal when the bias circuit is shorted ?
NO
Power stage defective
Check transistors at power stage for short.
YES
Bias circuit defective
Replace super-A ICs IC201 and IC202.
Check the temperature compensation circuit elements such as X013 for open.

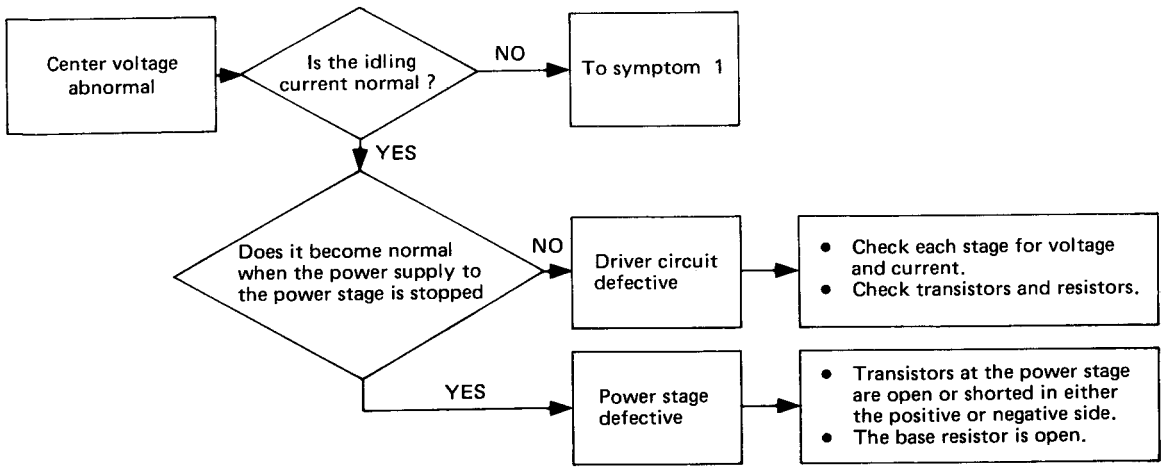
* To short the bias circuit, bridge the both terminals of C117 (C118).

Symptom 2


Although the output waveform is normal, the idling current does not flow.
Is the current at the final predriver stage normal ?
NO
Driver circuit defective
Check each stage for voltage and current.
Check transistors and resistors.
YES
Bias circuit defective
Replace super-A ICs IC201 and IC202.
Check the temperature compensation circuit elements such as X013 for sort.

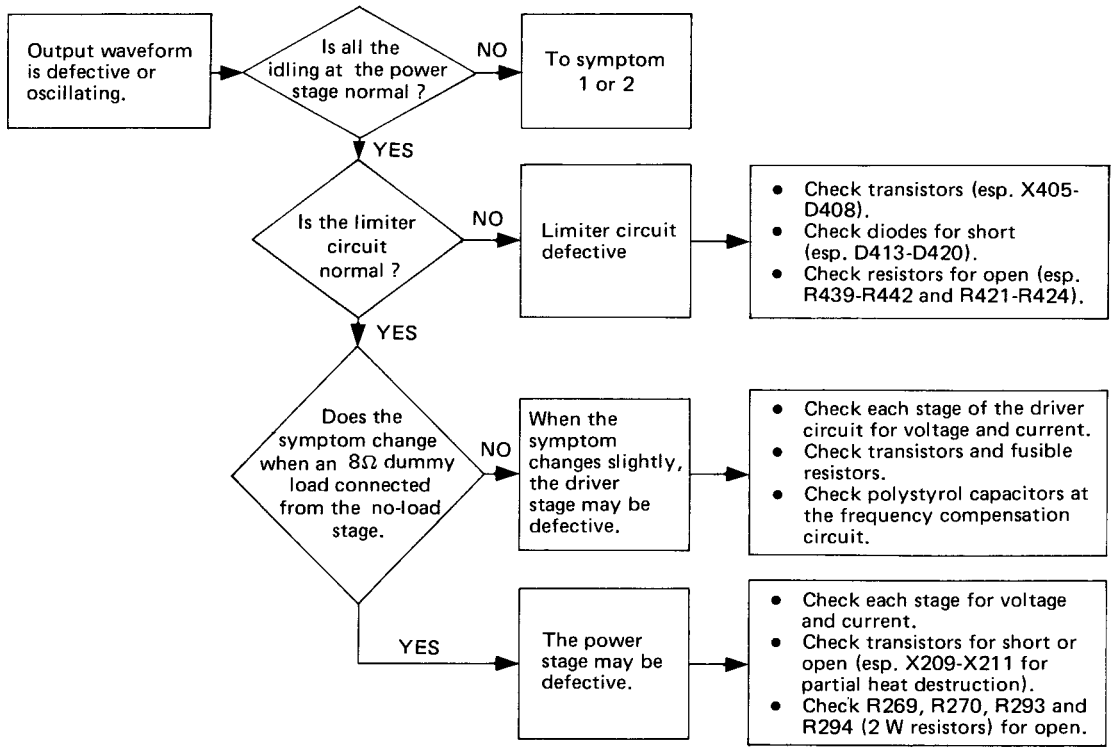
* Measure the current of the final predriver stage (X119-X126) at both ends of R157-R160. When the reading is about 10 mA, it is normal.

Symptom 3


Center voltage abnormal
Is the idling current normal ?
NO
To symptom 1
YES
Does it become normal when the power supply to the power stage is stopped
NO
Driver circuit defective
• Check each stage for voltage and current.
• Check transistors and resistors.
YES
Power stage defective
• Transistors at the power stage are open or shorted in either the positive or negative side.
• The base resistor is open.

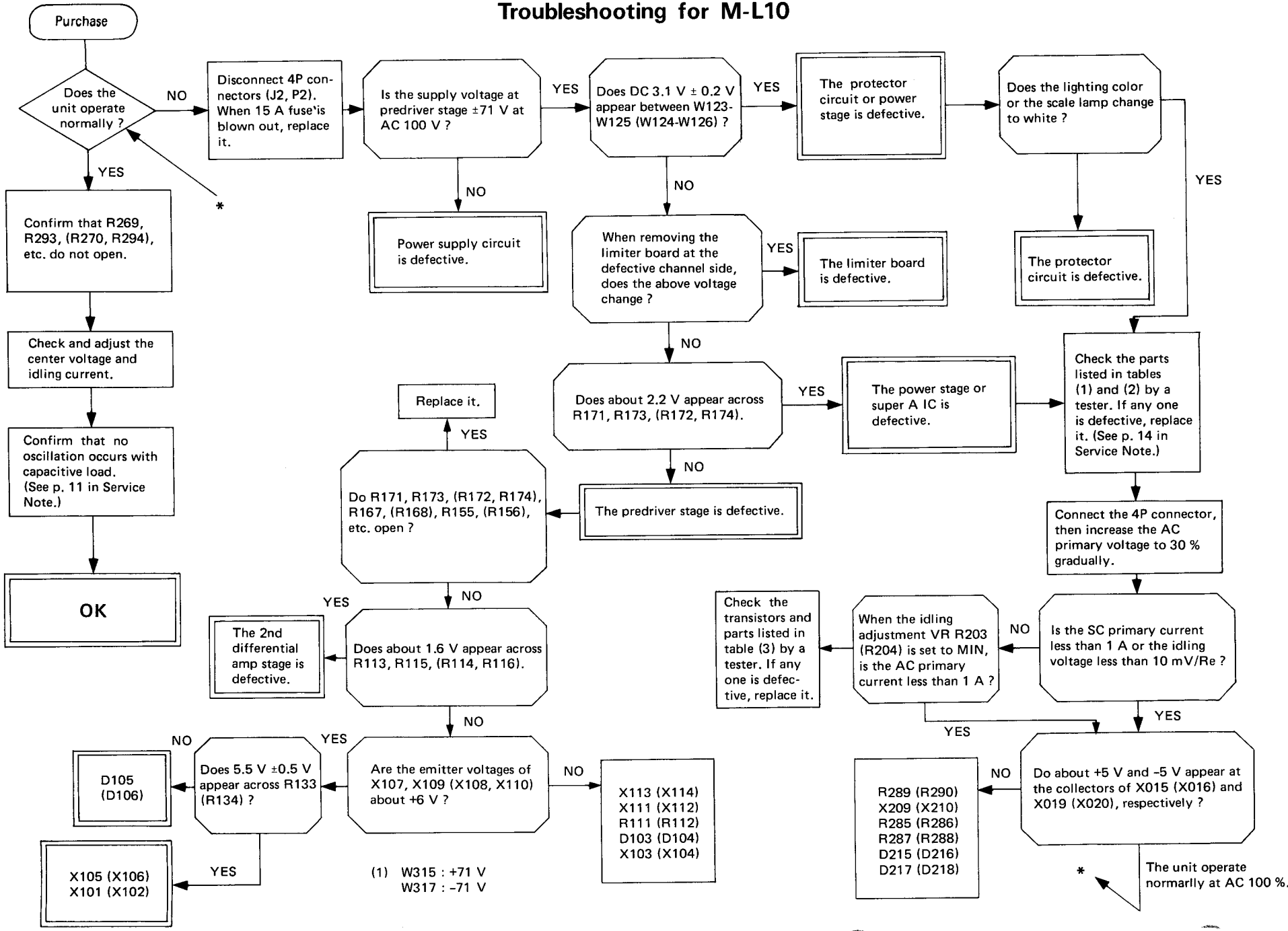
* The power supply to the power stage is cut off by disconnecting the connectors (P2, J2: 4-pin connectors, red-black-black-orange) of the leads of the toroidal transformer. However, the inrush protection circuit goes inoperative at the same time. This does not matter practically.

Symptom 4


Output waveform is defective or oscillating.
Is all the idling at the power stage normal ?
NO
To symptom 1 or 2
YES
Is the limiter circuit normal ?
NO
Limiter circuit defective
• Check transistors (esp. X405-D408).
• Check diodes for short (esp. D413-D420).
• Check resistors for open (esp. R439-R442 and R421-R424).
YES
Does the symptom change when an 8Ω dummy load connected from the no-load stage.
NO
When the symptom changes slightly, the driver stage may be defective.
• Check each stage of the driver circuit for voltage and current.
• Check transistors and fusible resistors.
• Check polystyrol capacitors at the frequency compensation circuit.
YES
The power stage may be defective.
• Check each stage for voltage and current.
• Check transistors for short or open (esp. X209-X211 for partial heat destruction).
• Check R269, R270, R293 and R294 (2 W resistors) for open.

* The limiter circuit can be checked with TXX-327-3 and TXX-327-4 removed.

# Troubleshooting for M-L10


Purchase
Does the unit operate normally ?
NO
YES
*
Disconnect 4P connectors (J2, P2). When 15 A fuse is blown out, replace it.
Is the supply voltage at predriver stage ±71 V at AC 100 V ?
YES
NO
Power supply circuit is defective.
Does DC 3.1 V ± 0.2 V appear between W123-W125 (W124-W126) ?
YES
NO
The protector circuit or power stage is defective.
When removing the limiter board at the defective channel side, does the above voltage change ?
YES
The limiter board is defective.
NO
Does the lighting color or the scale lamp change to white ?
YES
The protector circuit is defective.
Confirm that R269, R293, (R270, R294), etc. do not open.
Check and adjust the center voltage and idling current.
Confirm that no oscillation occurs with capacitive load. (See p. 11 in Service Note.)
OK
Does about 2.2 V appear across R171, R173, (R172, R174).
YES
The power stage or super A IC is defective.
NO
The predriver stage is defective.
Check the parts listed in tables (1) and (2) by a tester. If any one is defective, replace it. (See p. 14 in Service Note.)
Connect the 4P connector, then increase the AC primary voltage to 30 % gradually.
Is the SC primary current less than 1 A or the idling voltage less than 10 mV/Re ?
NO
When the idling adjustment VR R203 (R204) is set to MIN, is the AC primary current less than 1 A ?
NO
Check the transistors and parts listed in table (3) by a tester. If any one is defective, replace it.
YES
YES
Do about +5 V and -5 V appear at the collectors of X015 (X016) and X019 (X020), respectively ?
NO
R289 (R290)
X209 (X210)
R285 (R286)
R287 (R288)
D215 (D216)
D217 (D218)
*
The unit operate normarlly at AC 100 %.
Do R171, R173, (R172, R174), R167, (R168), R155, (R156), etc. open ?
YES
Replace it.
NO
Does about 1.6 V appear across R113, R115, (R114, R116).
YES
The 2nd differential amp stage is defective.
NO
Are the emitter voltages of X107, X109 (X108, X110) about +6 V ?
YES
NO
X113 (X114)
X111 (X112)
R111 (R112)
D103 (D104)
X103 (X104)
Does 5.5 V ±0.5 V appear across R133 (R134) ?
YES
NO
D105 (D106)
X105 (X106)
X101 (X102)
(1) W315 : +71 V
W317 : -71 V

# 4. Hints on Other Checks

(1) Almost all defects tends to occur even under 30 % of AC voltage.
When the symptom appears even under 30 % of AC voltage, check at a voltage as low as possible. (This is because even when abnormality occurs, the AC voltage, when low, seldom damages the final stage.)
* In this case, since the speaker relay doe not turn on, observe the waveform before this relay. (TP13, TP14)

(2) When servicing the driver circuit, checking is also possible by shorting the bias circuit (the both leads of C117 and C118) or by removing the power supply connectors (P2, J2) to the power stage. (This prevents overcurrent from flowing into the final stage.)
In this case, although the operating condition of the driver stage changes, checking is possible to a certain extent.
* When reconnecting the connectors, be sure to wrap a specified tape to protect them against disengaging.

(3) Intermittent occurrence of symptom results largely from extra solder attached to parts leads or transistors half-destroyed by heat when the temperature changes.
In this case, a partial heating with a dryer or cooling agent will locate the defect.
* When heating, pay attention to the parts susceptible to heat. (esp., polystyrol capacitors)

# 5. Detailed Service Hints when Power Stage is Damaged

Based upon the shorting test data at the stage of designing the M-L10 in accordance with the safety standards, the parts likely to fail when the power stage is damaged are listed in the order of failure rate.
Check according to the following procedures and replace the defective parts.

**(1)** The transistors listed below are most likely to be defective when stress is applied to the power stage. Even when the checking with a tester shows no failure, replace all the listed transistors associated with the defective channel because the stress may reduce the reliability.

| Part No. | Lch ref. No. | Rch ref. No. | Remarks |
|---|---|---|---|
| 2SC2565LB(0)<br>2SA1095LB(0) | X001, X003<br>X005, X007 | X002, X004<br>X006, X008 | Power transistors at final power cascpde stage (heatsink div.) |
| 2SD1064UA(R)<br>2SB828UA(R) | X015, X017<br>X019, X021 | X016, X018<br>X020, X022 | Power transistors at final Darlington stage (sub-heatsink div.) |
| 2SC2240(GR,BL)<br>2SA1084(D,E) | X211<br>X209 | X212<br>X210 | Power cascode buffer amp div. (TAP-292) |

(2) The parts listed below are most likely to fail when the power stage is damaged. Since the fusible resistors are opended symptomatically, be sure to check resistance in the x 1 ohm range of a tester and replace them with the specified ones if defective.

| Part No. | Lch ref. No. | Rch ref. No. | Remarks | |
|---|---|---|---|---|
| QRZ0052-270 | R239, R241, R243, R245 | R240, R242, R244, R246 | Fusible resistors 27 Ω | TAP-292 |
| QRZ0052-330 | R235, R237 | R236, R238 | Fusible resistors 33 Ω | |
| QRZ0052-100 | R285, R287 | R286, R288 | Fusible resistors 10 Ω | |
| 2SA965(O,Y) | X405 | X406 | Emitter follower | TXX-327-3(L) TXX-327-4(R) Limiter circuit |
| 2SC2235(O,Y) | X407 | X408 | " | |
| QRZ0052-150 | R439, R441 | R440, R442 | Fusible resistors 15 Ω | |
| QRZ0052-102 | R421, R423 | R442, R424 | Fusible resistors 1 kΩ | |

**Note:**
In most cases, replacing parts in items **(1)** and **(2)** will permit the unit to operate normal. If the defect cannot be cleared, check the parts listed on next page in item **(3)**.

(3) The parts listed below fail occasionally when power transistors are damaged.

| Part No. | Lch ref. No. | Rch ref. No. | Remarks | |
|---|---|---|---|---|
| 2SC2238B(0)<br>2SA968B(0) | X009<br>X011 | X010<br>X012 | Transistors at 1st power cascode stage | Heatsink division |
| 2SC2235(O,Y)<br>2SA965(O,Y) | X213<br>X215 | X214<br>X216 | Transistors at 2nd Darlington stage | TAP-292 |
| 2SC2240(GR,BL)<br>2SA970(GR,BL) | X201<br>X203 | X202<br>X204 | Transistors at 1st Darlington stage | |
| QRZ0052-151 | R229 | R230 | Fusible resistors 150 Ω, base resistors at 2nd Darlington stage | |
| QRZ0052-101 | R231 | R232 | Fusible resistors 100 Ω, base resistors at 2nd Darlington stage | |
| QRZ0052-331 | R207, R209 | R208, R210 | Fusible resistors 330 Ω, base resistors at 1st Darlington stage | |
| QRZ0052-680 | R233 | R234 | Fusible resistors 68 Ω, emitter resistors at 2nd Darlington stage | |
| QRZ0052-561 | R215 | R216 | Fusible resistors 560 Ω, emitter resistors at 1st Darlington stage | |
| QRZ0052-471 | R279 | R280 | Fusible resistors 470 Ω, super-A feedback resistors | |
| VC5022(X,Y) | IC201 | IC202 | Super-A ICs | |

## Current mirror Circuit

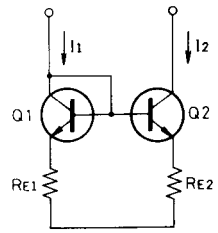



Fig. 21

The diagram shows a current mirror circuit. Assuming that $Q_1$ and $Q_2$ are transistors well balanced in characteristrics, their relationship is represehted by the following expression:

$$I_2 = \frac{I_1}{1 + 2/\beta} \qquad \text{(Provided that } R_{E1} = R_{E2}\text{)}$$

If $\beta$ is sufficiently large, $I_1 \fallingdotseq I_2$. Here, the same amount of current flows through the two transistors.

# 6. How to Clean and Repair the Cabinet

## 6-1 How to Clean

To clean the cabinet, soak a piece of dry, soft cloth with a liquid wax (silicone wax) available in markets, wipe the cabinet thoroughly, and finish with dry cloth evenly.

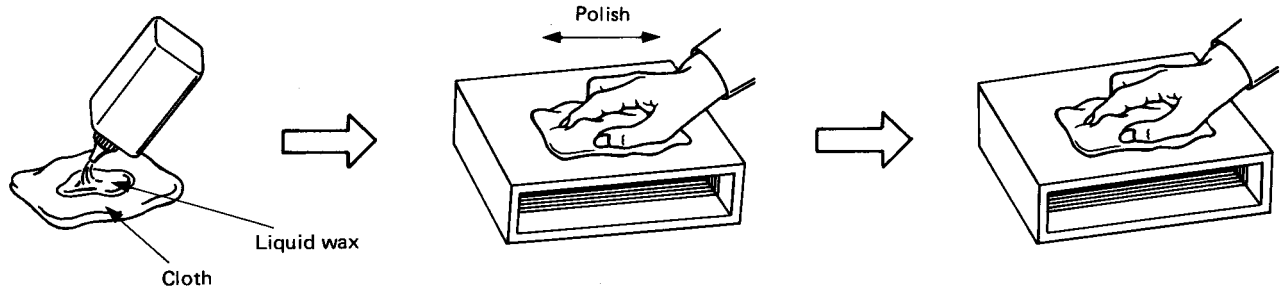



Fig. 22

## 6-2 How to Repair

### Slight scratches

Grind the scratched part with water-resisting sand-paper of #800-1000 with the aid of water until scratches are removed. Apply rubbing compound to cloth and polish the surface with considerable force until the traces of sandpaper disappear and the surface becomes lustrous. Apply silicone wax to cloth and wipe the surface with it finally.

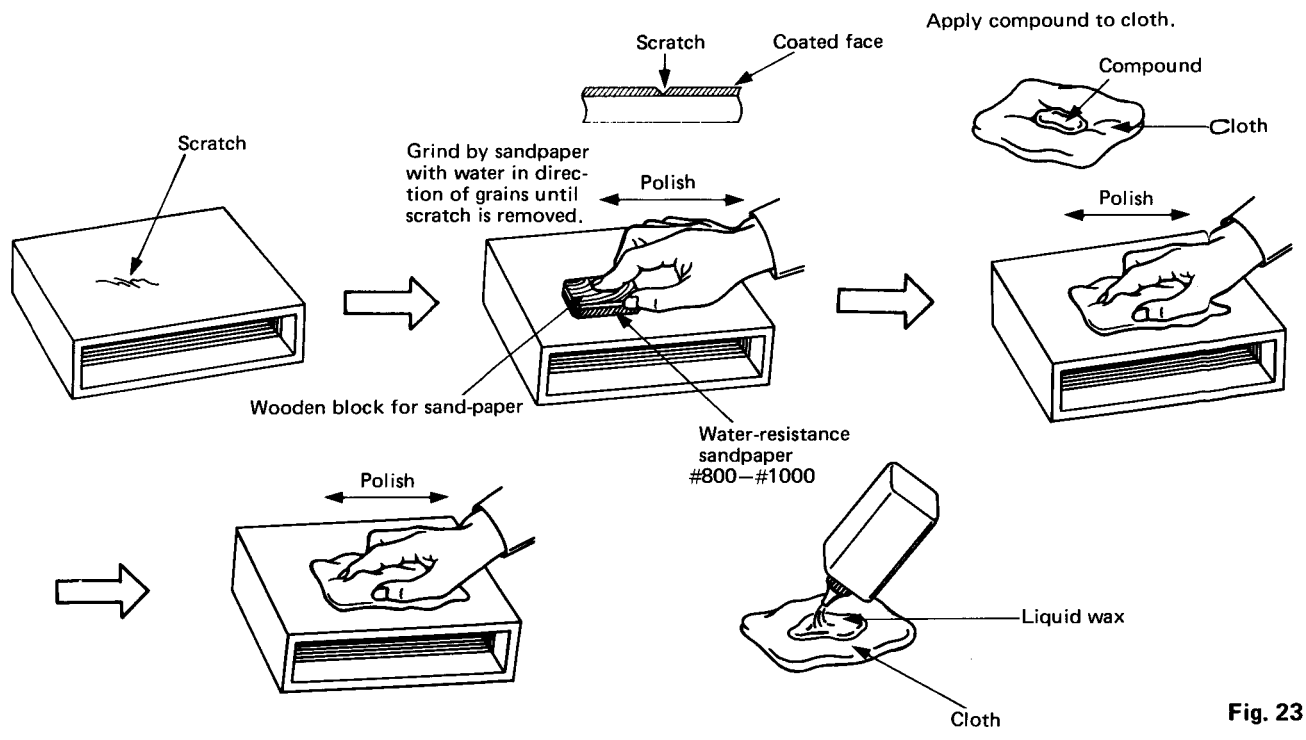



Fig. 23

## Serious scratches

Coat a scratched part with lacquer enamel two to three times in such a manner that the color is first lighter than at the surrounding part and then color becomes deeper. Apply thick transparent lacquer thickly to the part with the tip of a thin brush. When it has dried up (it takes about 8 hours), grind with water-resisting sandpaper of #800-1000 using water. When the surface has become level, polish it with rubbing compound until traces of sandpaper disappear and the surface becomes lustrous. Apply silicone wax to cloth and wipe the surface with it finally.

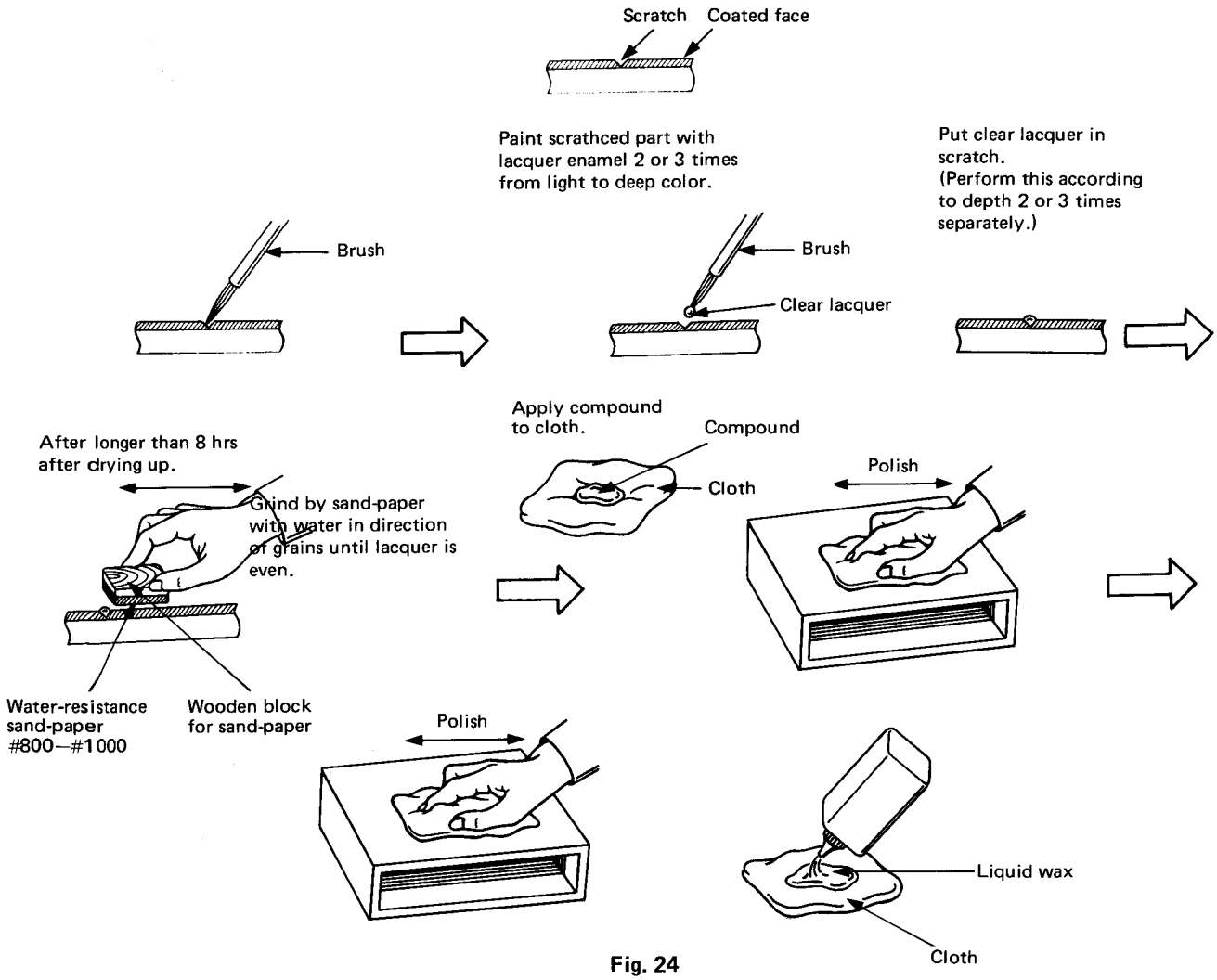

Scratch
Coated face
Paint scrathced part with lacquer enamel 2 or 3 times from light to deep color.
Put clear lacquer in scratch. (Perform this according to depth 2 or 3 times separately.)
Brush
Brush
Clear lacquer
After longer than 8 hrs after drying up.
Grind by sand-paper with water in direction of grains until lacquer is even.
Water-resistance sand-paper #800—#1000
Wooden block for sand-paper
Apply compound to cloth.
Compound
Cloth
Polish
Polish
Liquid wax
Cloth

Fig. 24

## Contusion

Put an annealed lac in the contusion, then write grains with lacquer enamel of the same color as the surrounding grains in such a manner that the color is first lighter and then deeper. Spray it with transparent lacquer two or three times. When it has dried up, grind with water-resisting sandpaper of #800-1000 using water. When the surface has become level, polish it with rubbing compound until the traces of sandpaper disappear and the surface becomes lustrous. Apply silicone wax to cloth and wipe the surface with it finally.

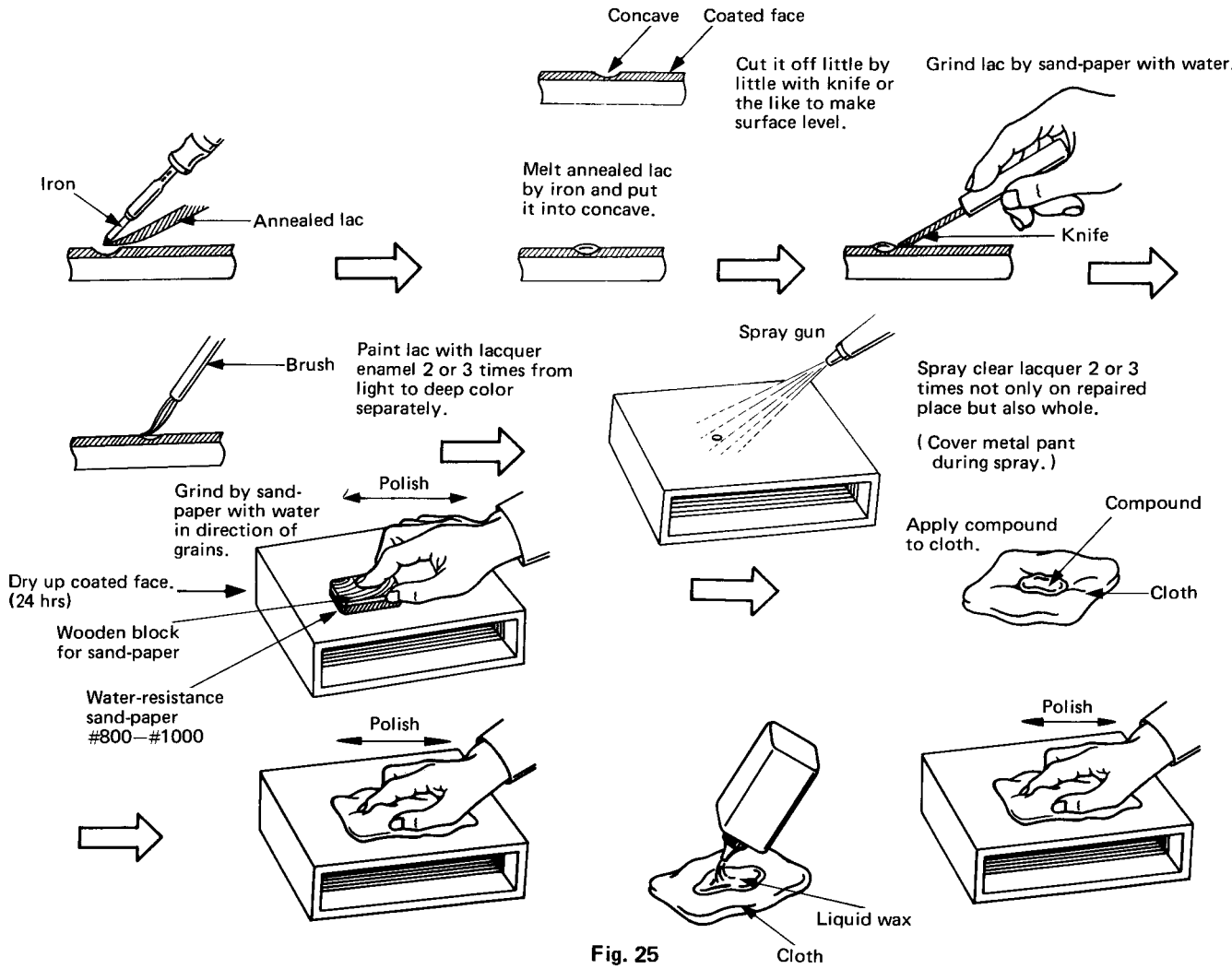

Concave
Coated face
Cut it off little by little with knife or the like to make surface level.
Grind lac by sand-paper with water.
Iron
Annealed lac
Melt annealed lac by iron and put it into concave.
Knife
Brush
Paint lac with lacquer enamel 2 or 3 times from light to deep color separately.
Spray gun
Spray clear lacquer 2 or 3 times not only on repaired place but also whole.
( Cover metal pant during spray. )
Grind by sand-paper with water in direction of grains.
Polish
Compound
Apply compound to cloth.
Cloth
Dry up coated face. (24 hrs)
Wooden block for sand-paper
Water-resistance sand-paper #800—#1000
Polish
Polish
Liquid wax
Cloth

Fig. 25

## Discolored edge

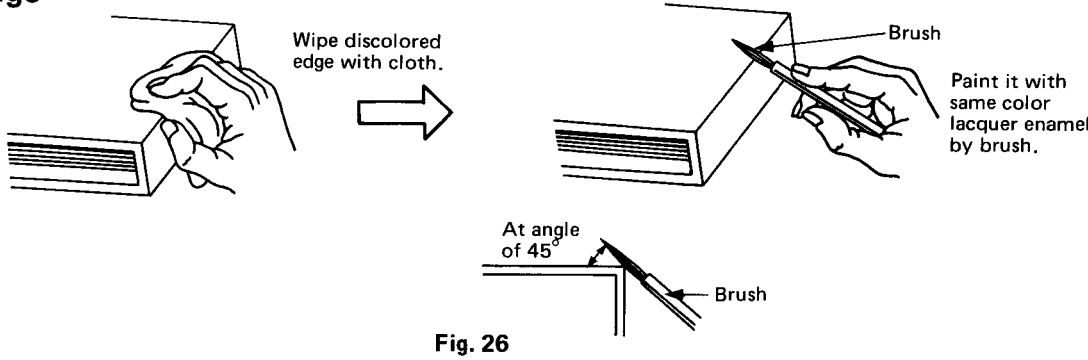



Fig. 26

JVC

VICTOR COMPANY OF JAPAN, LIMITED, TOKYO, JAPAN

Printed in Japan

# M-L10

# SERVICE MANUAL

# Contents


1. Service Precautions
   1-(1) For safety
   1-(2) Caution when powering the unit after repair
2. Adjustment Procedures
   2-(1) Level adjustment of power meter
   2-(2) Adjustment of center voltage
   2-(3) Adjustment of idling current
3. Disassembly
   3-(1) Removal Procedures of Cabinet
   3-(2) Removal Procedures of Power Transformer
   3-(3) Removal Procedures of Power Meter
4. Connection Diagram

Schematic Diagram & Block Diagram


# 1. Service Precautions

## 1-(1) For safety

1. When replacing the parts marked with ⚠ , be sure to use the designated parts to ensure safety.
2. If the power cord has been replaced, pull the cord in all directions to see that it does not come off.
3. Parts and wires which are related with supply power should be bound and soldered.

## 1-(2) Caution when powering the unit after repair

Instantaneous application of 100 % of AC voltage may cause damage to power transistors again unless the unit is repaired completely.
For powering the unit, gradually increase the AC voltage with Variac referring to the following procedure.

1. Make sure that no lead of power capacitors (C1-C4, C301, C302, C307 and C308) is shorted.
2. First, keep the idling adjustment VRs (R203 and R204) turned fully counterclockwise. (bias: zero)
3. Observing the idling current at the power stage, gradually increase the AC voltage with Variac.
4. With no defect, the inrush relay turns on at about 30 % of AC voltage and the speaker relay at about 80 % of AC voltage. Even when the voltage is applied up to 100 % of AC voltage, the idling current observed on the oscilloscope remains zero.
5. Next, turn the adjustment VR to make sure the idling current can be varied. (0 mA to 400 mA)

Note : The voltage range of the oscilloscope while observing the idling current should be set to 50 mV/div. (≒200 mA/div.).

# 2. Adjustment Procedures

## 2-(1) Level adjustment of power meter

1. Make sure that the pointer of the meter reads 0 when power is off. When the pointer is away from 0, adjust it to the proper position.
2. Apply a signal of 1 kHz from the input terminal (SUBSONIC) then adjust the input signal level so that an output of 20 V appears at the SPEAKER terminals.
3. At this time, adjust R505 (Lch) and R506 (Rch) so that the pointer reads -5 dB (about 50 W).
4. Next, turn down the input signal by 20 dB and make sure that the pointer reads -25 ± 2 dB.

## 2-(2) Adjustment of center voltage

| P.C. Board name | Connection point (test point No.) | Adjustment point (VR No.) | Setting voltage | Remarks |
|---|---|---|---|---|
| Drive amp. P.C. Board (TAP-292A) | TP13-GND | R123 | 0 ± 5 mV | Lch |
| | TP14-GND | R124 | 0 ± 5 mV | Rch |

GND : Negative SPEAKER terminal

## 2-(3) Adjustment of idling current

Before powering, keep adjustment VR R203 and R204 turned fully counterclockwise, then adjust them after 1 minute from power-on.

| P.C. Board name | Connection point (test point No.) | Adjustment point (VR No.) | Setting voltage | Remarks |
|---|---|---|---|---|
| Drive amp. P.C. Board (TAP-292A) | TP13-TP1<br>TP13-TP3<br>TP13-TP7<br>TP13-TP9 | R203 | 8-12 mV<br>(10 mV center)<br>For idling current,<br>45 mA center | Lch |
| | TP14-TP4<br>TP14-TP6<br>TP14-TP10<br>TP14-TP12 | R204 | 8-12mV<br>(10 mV center)<br>For idling current,<br>45 mA center | Rch |

**Note** : When the unit is cool right after power-on, the setting idling voltage is small (5-10 mV), while as the unit get warm, it increases and about 20 minutes later becomes stable (18-26 mV). Therefore, after 1 minute from power-on, adjust to 8-12 mV (10 mV center), then make sure the setting idling voltage is 18-26 mV when the idling becomes stable (about 20 minutes later).



# 3. Disassembly

## 3-(1) Removal Procedures of Cabinet

**Note:** In this work, it is recommeded that a soft cloth be put on the working table to avoid damage to the cabinet.

1. Remove four screws ① – ④ near the foot shown in **Fig 1**.
2. As shown in **Fig. 2**, put a mat or the like on the table, place the unit with its front downward and take out the cabinet.

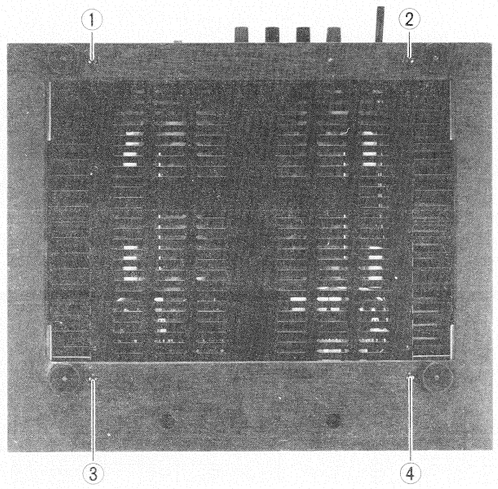



Fig. 1

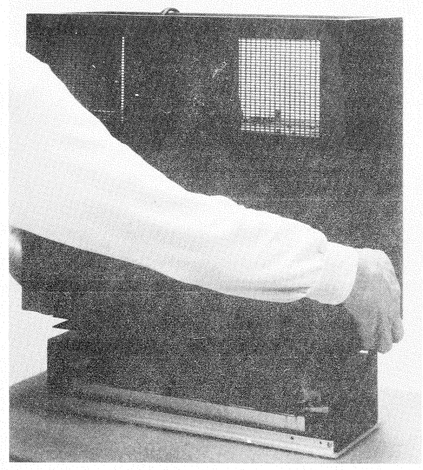


Fig. 2

## 3-(2) Removal Procedures of Power Transformer

1. Remove four mounting screws ① – ④ of the upper side of the heat sink.
2. Remove four screws ⑤ – ⑧ on the rear panel.
3. Disconnect the six wires from the connection sockets in the transformer.
4. Pull out the transformer together with its cover.

**Note:** When remounting, securely tighten the screws, and reinforce each socket connection with an adhesive tape so that no socket goes off at any time.

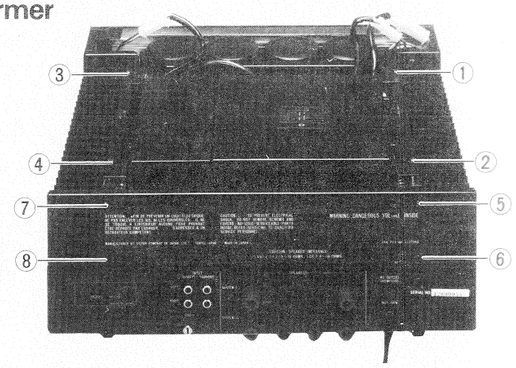



Fig. 3

## 3-(3) Removal Procedures of Power Meter

1. Remove of the front panel.
2. Remove soven screws ① – ⑦ of the dial back panel.
3. Hold both side of the dial back panel pull it out forward.
4. Remove two screws ⑧ – ⑨ on the mask plate, and remove of the lamp house of right side.
5. Remove of the meter scale in this manner shown in **Fig. 5**.
6. Remove mounting screws ① – ④ of the power meter.

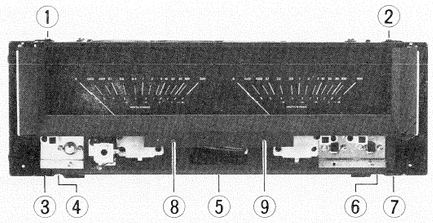



Fig. 4

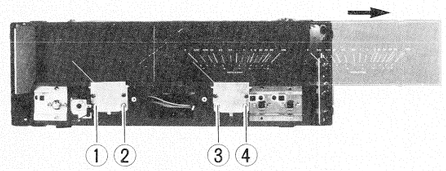



Fig. 5

M-L10
No. 2620

# Instruction on Extension Cord for M-L10

In M-L10, it is difficult to repair the PC board, unless the power transformer is removed.
In order to perform servicing more conveniently, use the extension cord.

## 1. How to use

1) After confirming that the power plug is unplugged, unlock each connector retaining the power transformer, then disconnect the cord. (See **Fig. A.**)
2) Remove the power transformer from the main body, then connect the accessory extension cord. (See **Photo 1**)
3) Employ an extension cord with the same color, number of pins and connector size as those of the transformer and main body cords, and connect each connector until it locks. (See **Photo 2**)
4) After putting the power transformer back to the same position, connect the all connections properly and wrap the locked portion of each connector two or three times with tape to secure it. (See **Photo 3**)

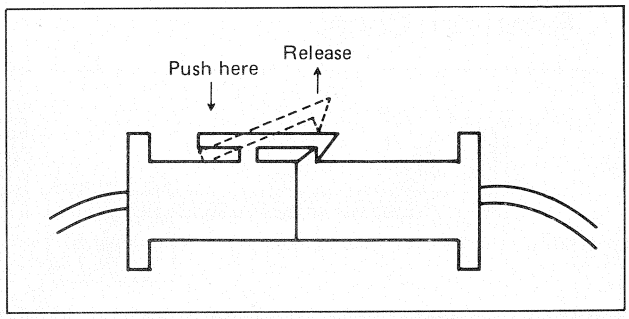



**Fig. A Side View of Connection**

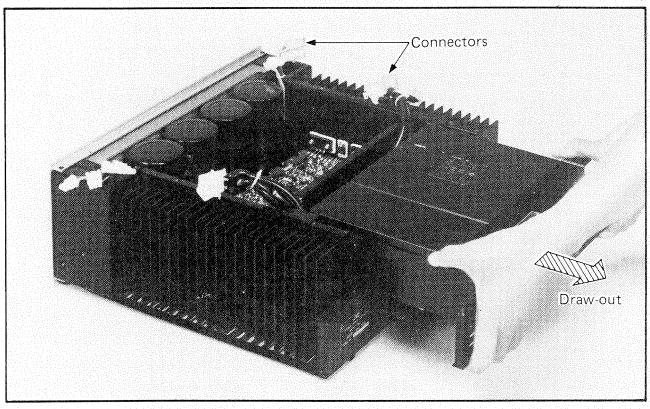



**Photo 1**

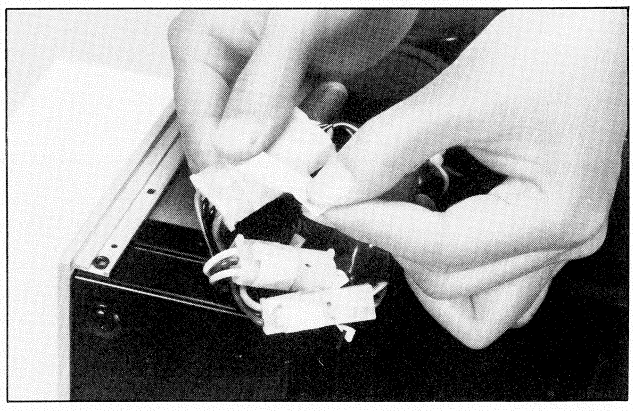


**Photo 3**

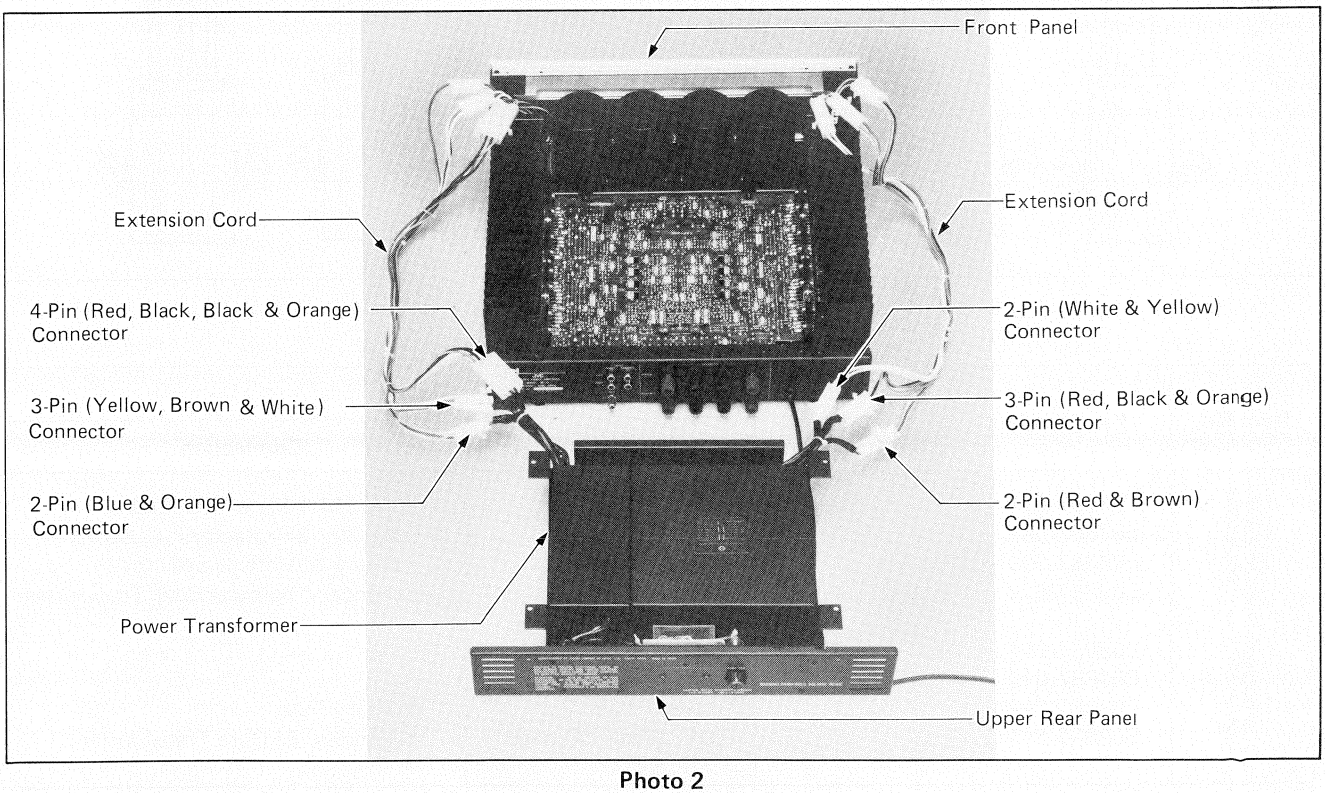

Front Panel
Extension Cord
Extension Cord
4-Pin (Red, Black, Black & Orange) Connector
2-Pin (White & Yellow) Connector
3-Pin (Yellow, Brown & White) Connector
3-Pin (Red, Black & Orange) Connector
2-Pin (Blue & Orange) Connector
2-Pin (Red & Brown) Connector
Power Transformer
Upper Rear Panel

**Photo 2**

## 2. Hints on correct use

1) Before turning the power ON, be sure to confirm that the color and pin number of each cord is identical with those of the other cord and that each connector is properly connected.

2) There are two connectors (2-pin and 3-pin types) for the extension cord. When a cord with a different color is connected mistakenly and the power is turned ON, the circuit will be damaged.

## 3. Extension Cords

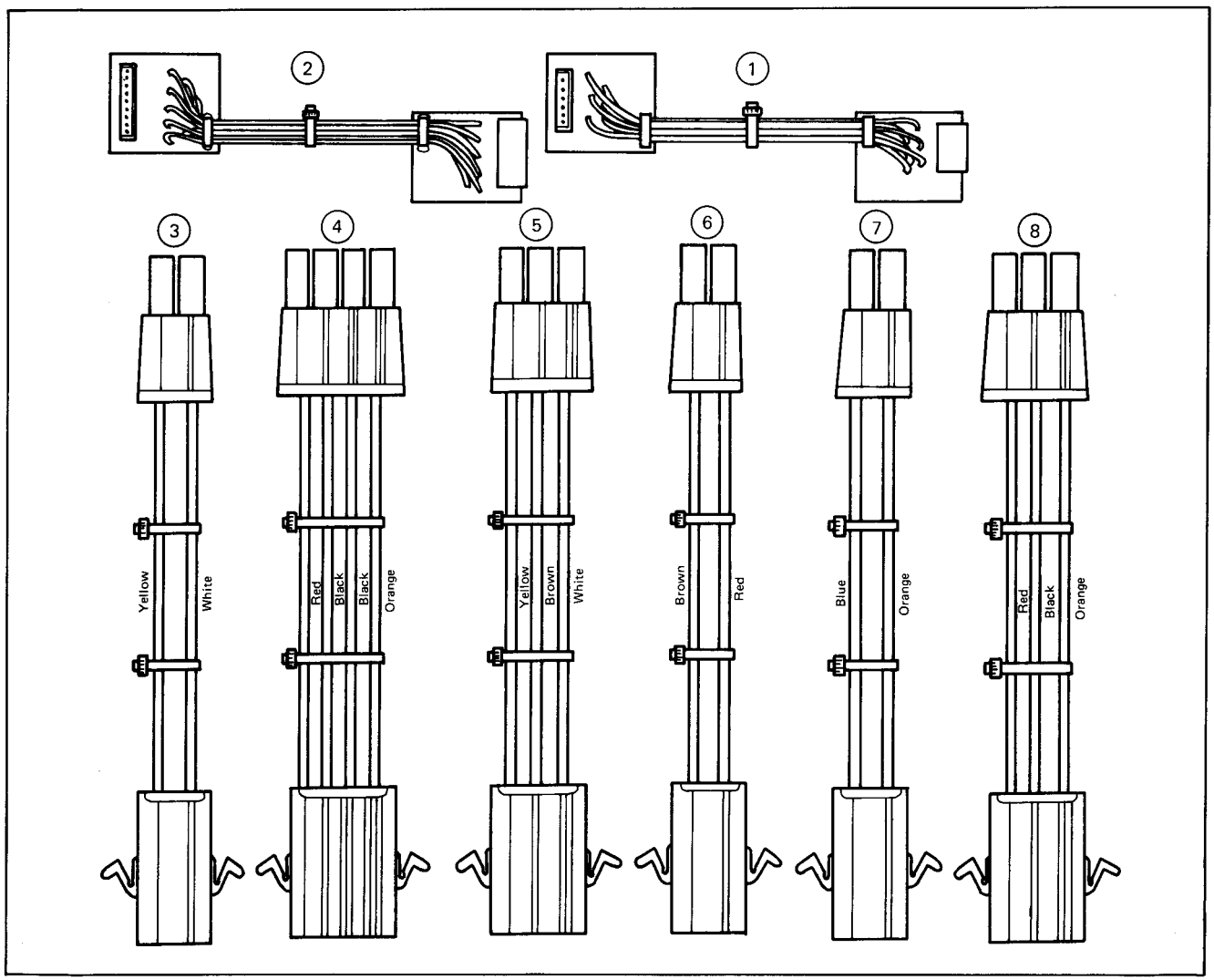
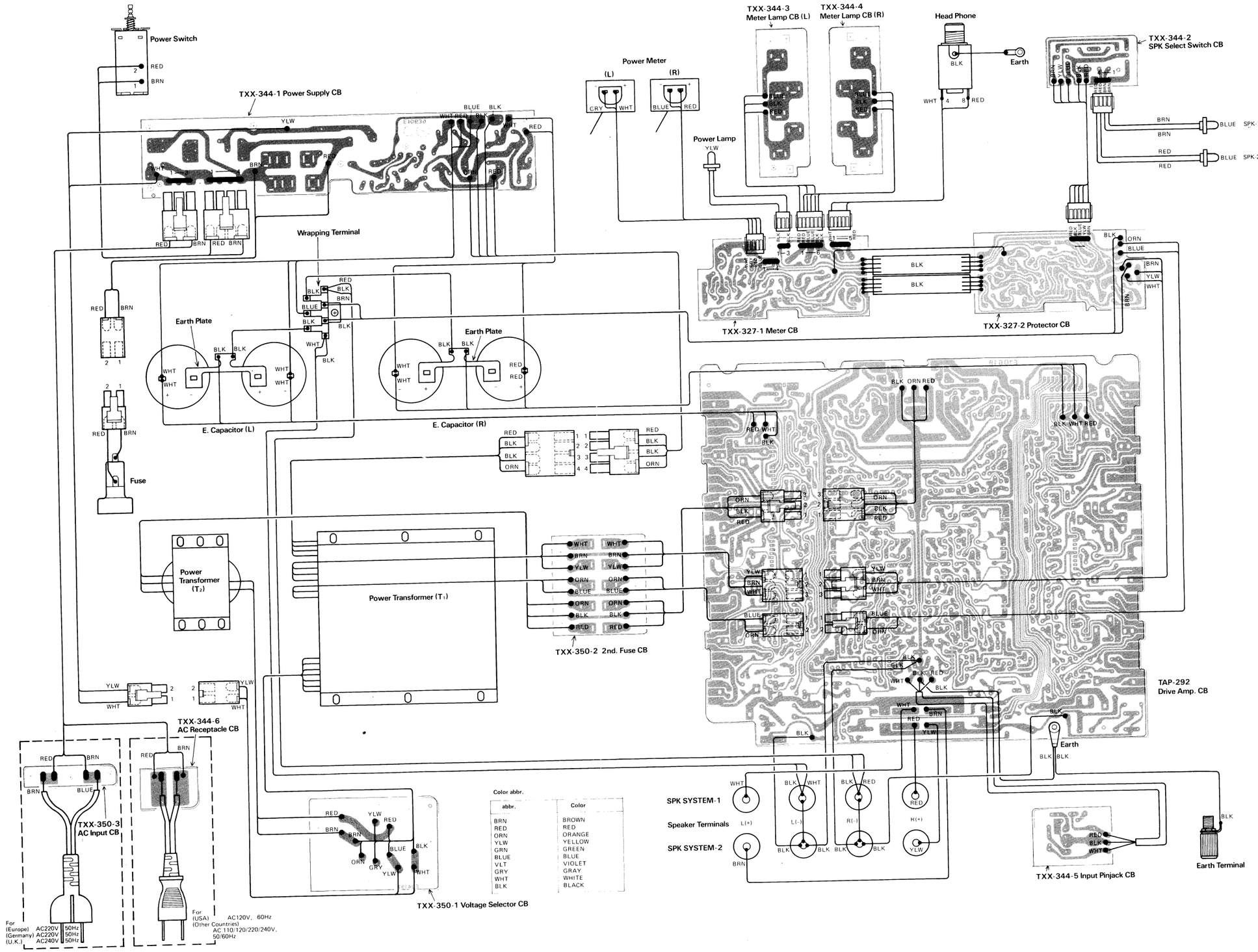



Fig. B

| Item No. | Part Number | Extension Cord | | |
|---|---|---|---|---|
| | | No. of Pin | Cord Color | Connection |
| ① | E03887-007 | 6 | | TXX-327-1 Meter P.C. Board |
| ② | E03887-008 | 9 | | TXX-327-2 Protector P.C. Board |
| ③ | E03887-009 | 2 | White / Yellow | Primary to Voltage Selector |
| ④ | E03887-010 | 4 | Red / Black / Black / Orange | Secondary Toroidal Core Transformer |
| ⑤ | E03887-011 | 3 | Yellow / Brown / White | " |
| ⑥ | E03887-012 | 2 | Blue / Orange | " |
| ⑦ | E03887-013 | 2 | Brown / Red | Primary Fuse |
| ⑧ | E03887-014 | 3 | Red / Black / Orange | Secondary EI Core Transformer |

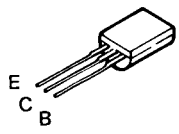
# 4. Connection Diagram



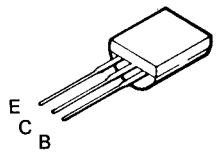
# M-L10 Schematic Diagram & Block Diagram

# Appearance of Transistors, ICs and Diodes

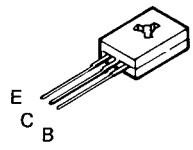
## Transistors



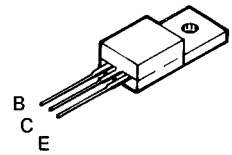

2SA872AV(D,E)
2SA970(GR,BL)
2SA1084(D,E)
2SC1775AV(E,F)
2SC2240(GR,BL)
2SC2546(E,F)



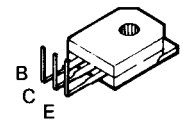

2SA965(O,Y)
2SA1208(S,T)
2SC2235(O,Y)
2SC2910(S,T)



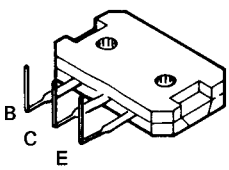

2SA1210(S,T)
2SB649A(B,C)
2SC1568(R,S)
2SC2912(S,T)
2SD669A(B,C)



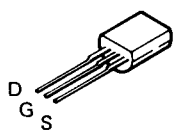

2SA968B(O)
2SB536(L,M)
2SC2238B(O)



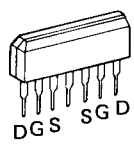

2SB828UA(R)
2SD1064UA(R)



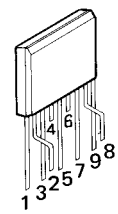

2SA1095LB(O)
2SC2565LB(O)




2SK246(BL,V)



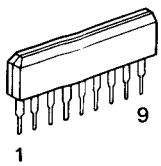

2SK150A(BL)



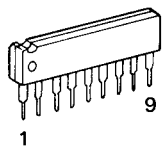

μPA75V(P,F)

1 . . . B1
2 . . . C1
3 . . . E1
4 . . . NC
5 . . . SUB
6 . . . NC
7 . . . E2
8 . . . C2
9 . . . B2

## Integrated Circuits

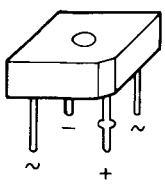



TA7317P
TA7318P(I)

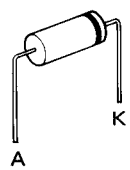



VC5022(X,Y)

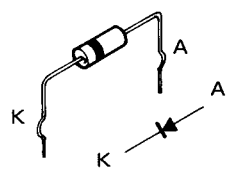
## Diodes



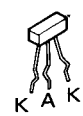

PB102F-6



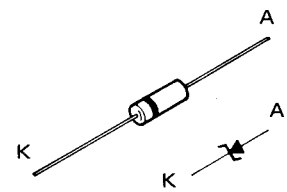

30DF2FA-2



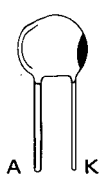

10DF2FD




S2VC20
S2VC20R

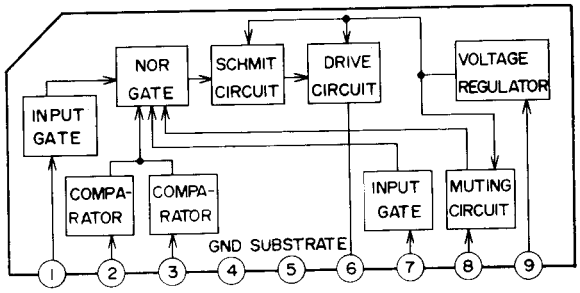



RD4.7EB2
RD6.2EB3
1S2076-31
1SS81
1S1925
HZ3ALL
HZ6B1L
HZ6C1L

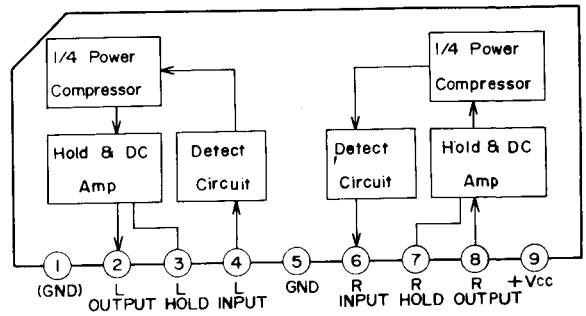



VD1220

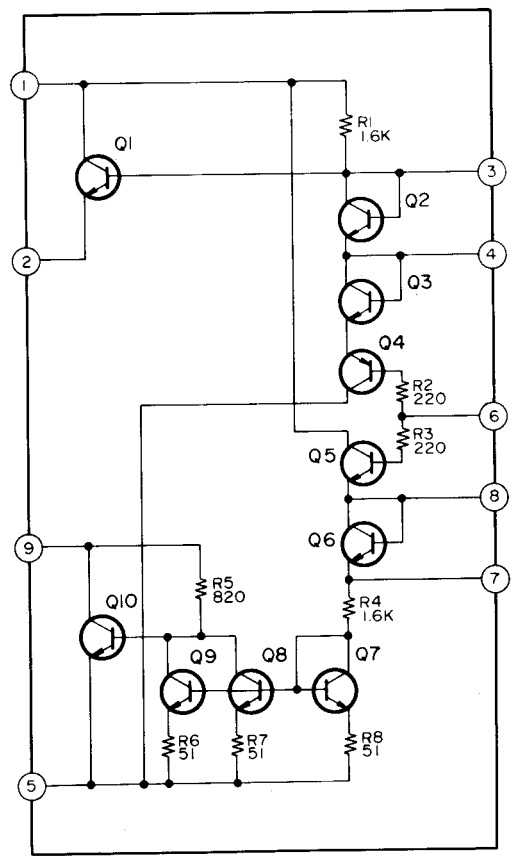
## TA7317P



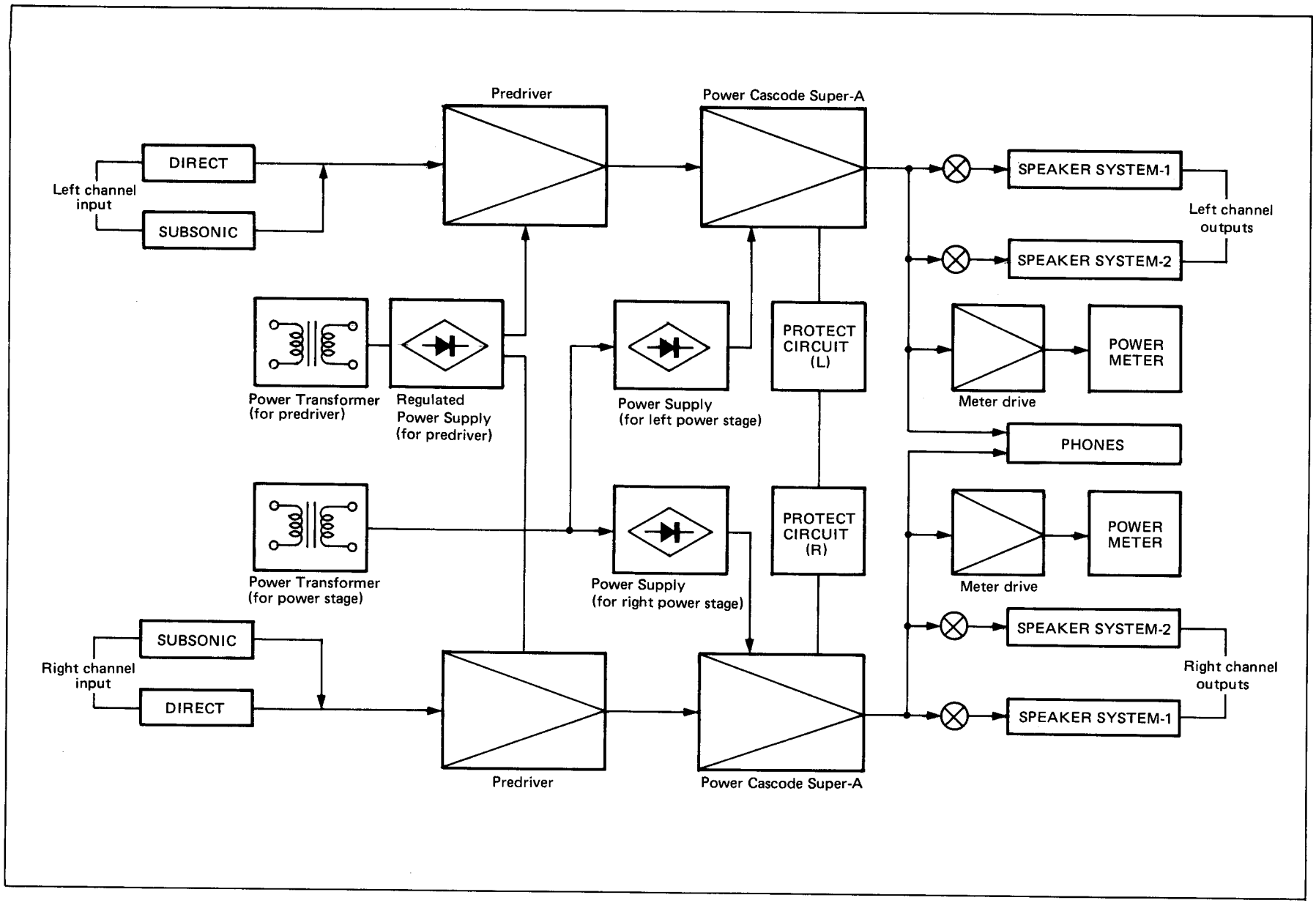

## TA7318P




## VC5022



# Block Diagram



JVC

VICTOR COMPANY OF JAPAN, LIMITED, TOKYO, JAPAN

Printed in Japa

# M-L10

# PARTS MANUAL

## Contents


Page

1. Main Parts Locations . . . . . 1
   1-(1) Front View . . . . . 1
   1-(2) Rear View . . . . . 1
   1-(3) Top View . . . . . 1
2. Exploded View and Part Numbers . . . . . 2
3. Printed Circuit Board Ass'y and Parts List . . . . . 4
   3-(1) TXX-327A Protector & Meter P.C. Board Ass'y . . . . . 4
   3-(2) TXX-350□ AC Unit P.C. Board Ass'y . . . . . 6
   3-(3) TXX-344□ Power Supply P.C. Board Ass'y . . . . . 7
   3-(4) TAP-292A Drive Amp. P.C. Board Ass'y . . . . . 8
4. Packing Materials and Part Numbers . . . . . 12
5. Accessories List . . . . . 13
6. Parts List with Specified Numbers for Designated Areas . . . . . 14

# 1. Main Parts Locations

## 1-(1) Front View

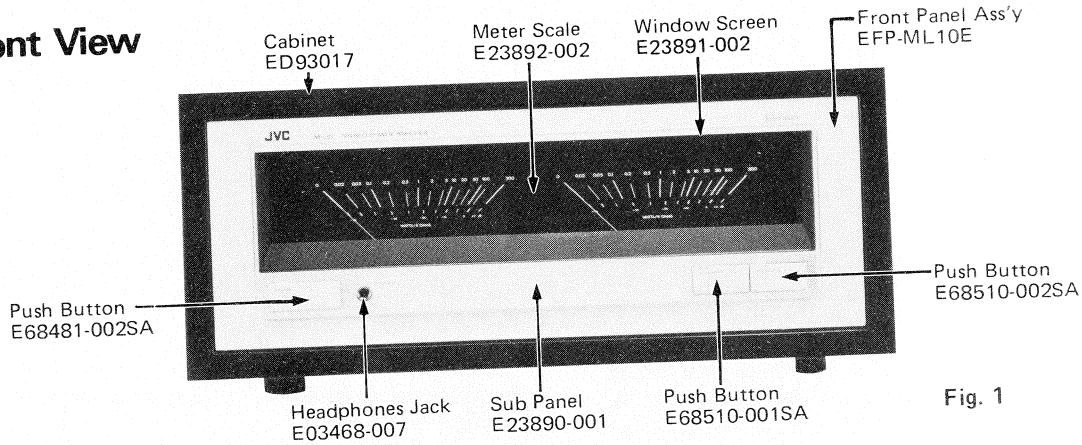



Fig. 1

## 1-(2) Rear View

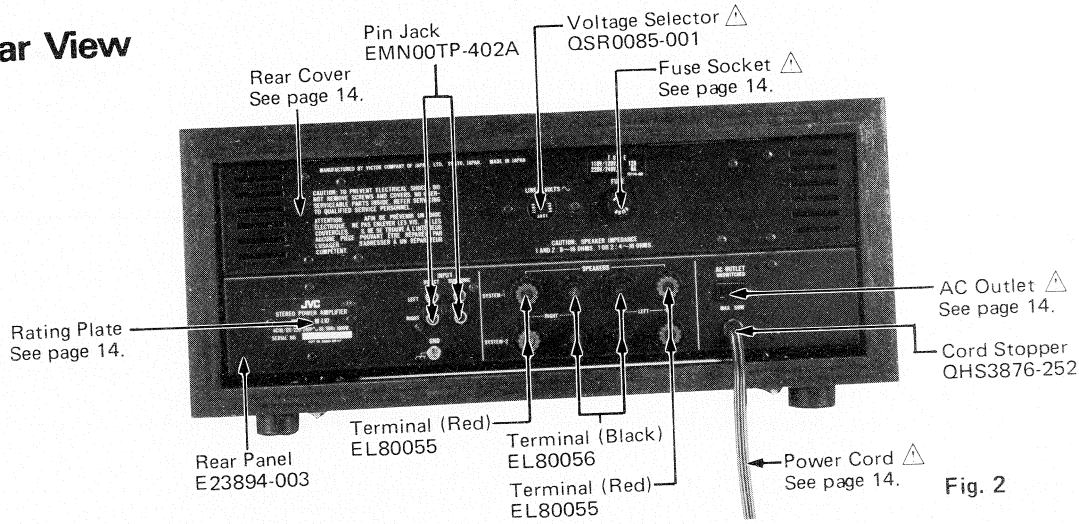



Fig. 2

## 1-(3) Top View

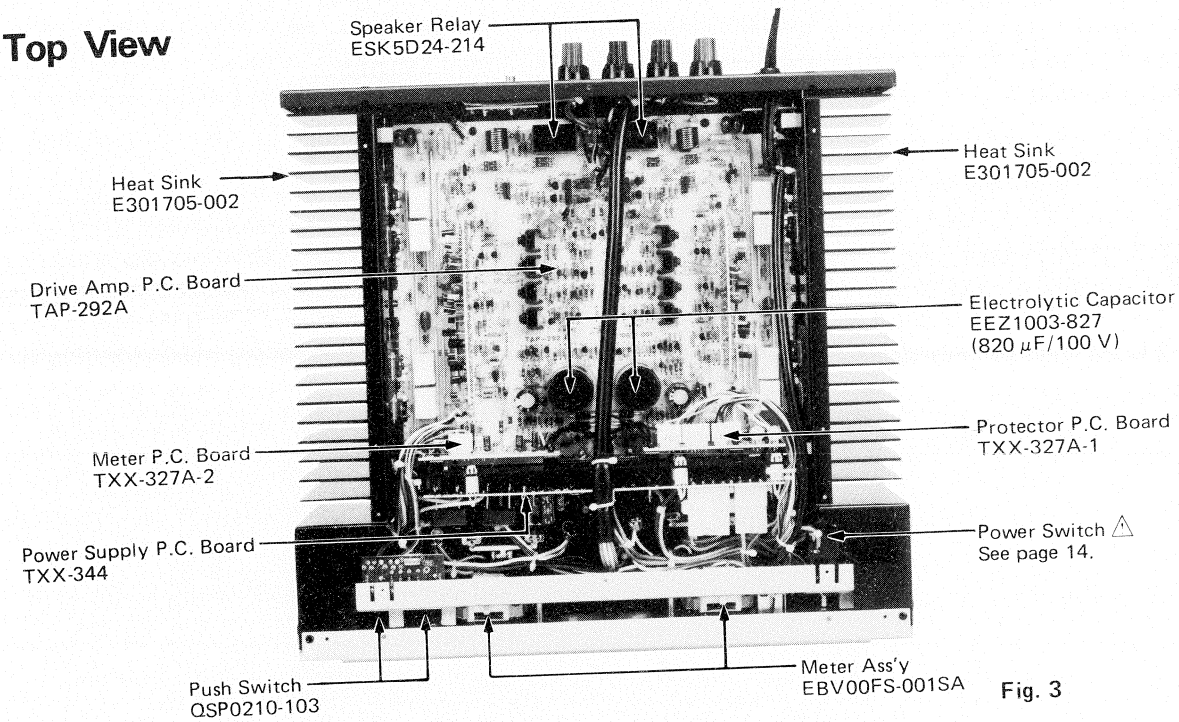



Fig. 3

# 2. Exploded View and Part Numbers

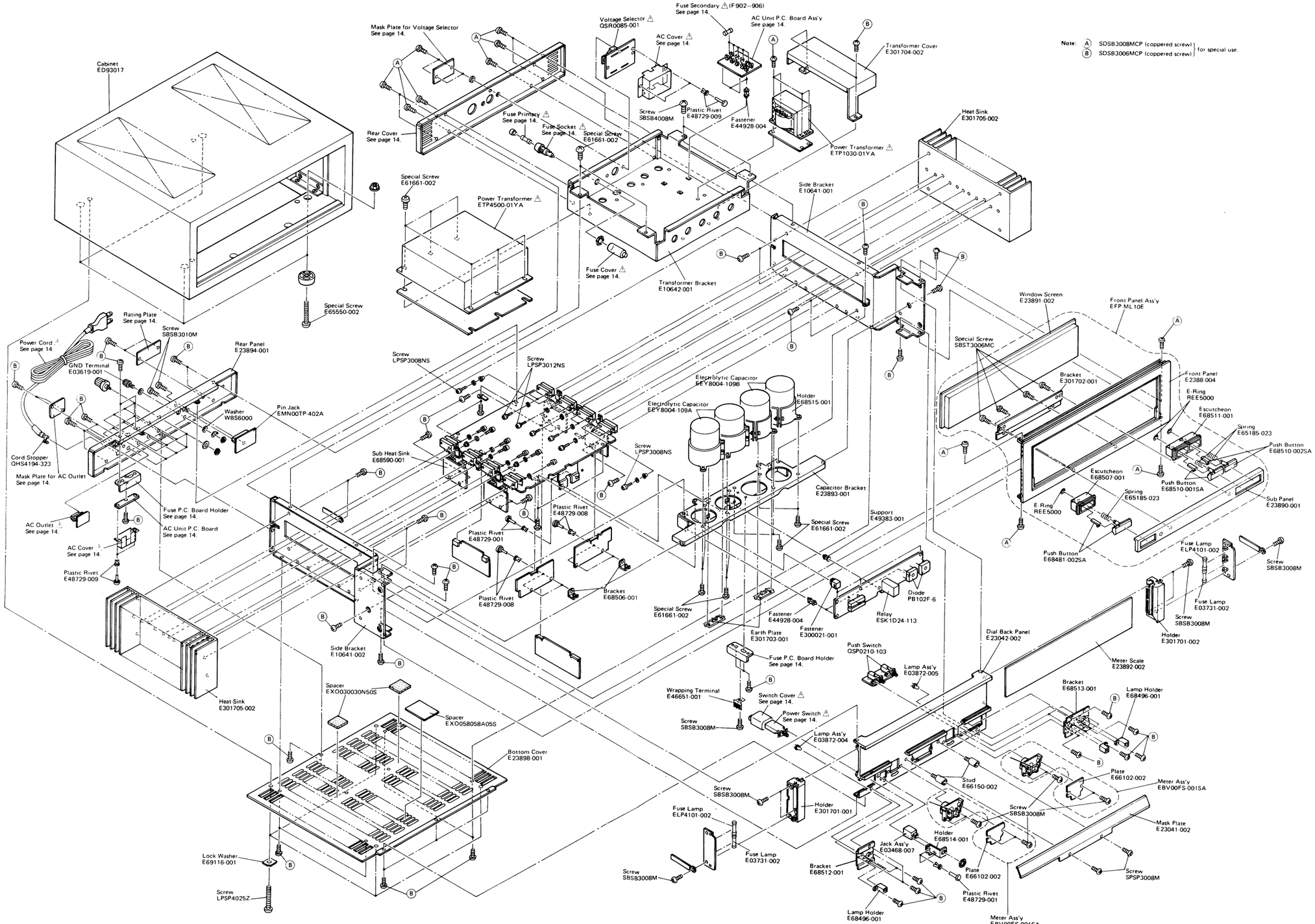



**Fig. 4**

# 3. Printed Circuit Board Ass'y and Parts List

## 3-(1) TXX-327A Protector & Meter P.C. Board Ass'y

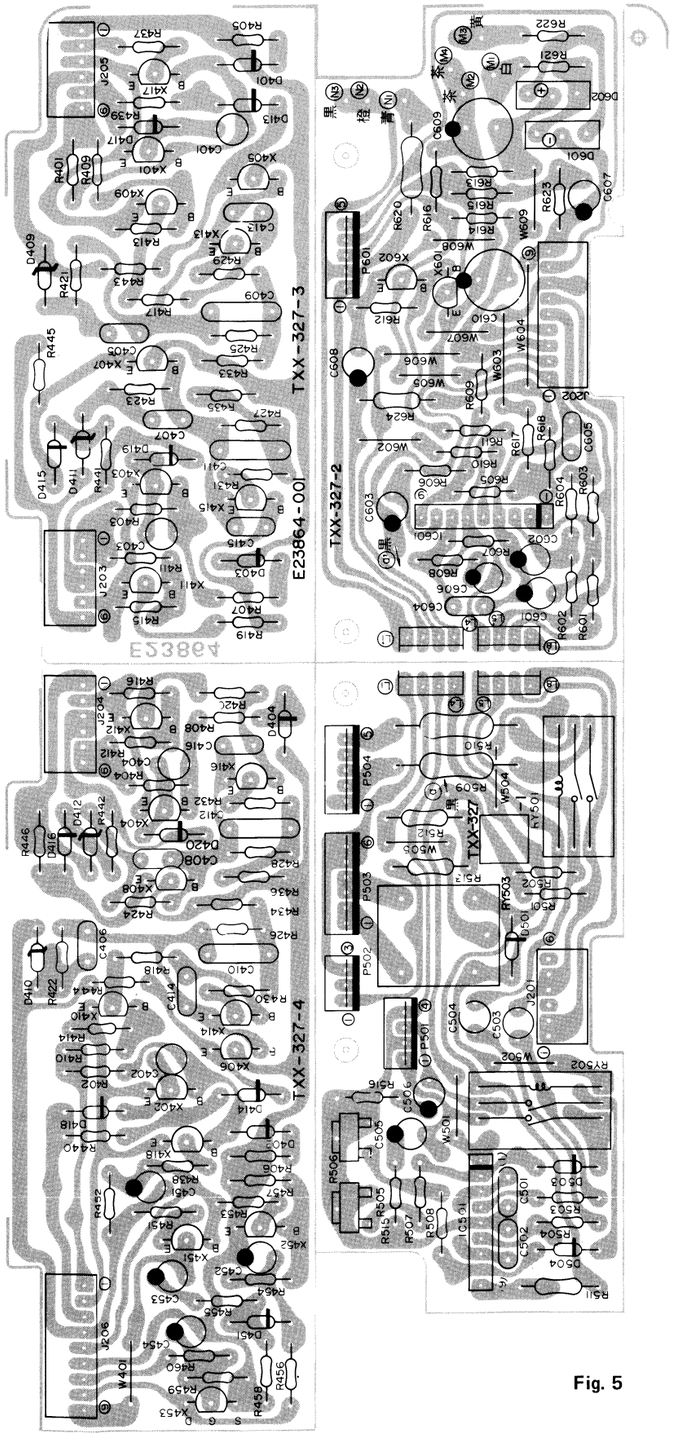



Fig. 5

**Note:**
The symbols ( 赤、黒、白 ...etc.) on P.C. Board surface are factory process only.

**Transistors**

| Item No. | Part Number | Rating | | Description | |
|---|---|---|---|---|---|
| | | Pc | fT | | Maker |
| X401 | 2SC2240(GR,BL) | | | Silicon | Toshiba |
| X402 | 2SC2240(GR,BL) | | | " | Sanyo |
| X403 | 2SA970(GR,BL) | | | " | Toshiba |
| X404 | 2SA970(GR,BL) | | | " | " |
| X405 | 2SA965(O,Y) | | | " | " |
| X406 | 2SA965(O,Y) | | | " | " |
| X407 | 2SC2235(O,Y) | | | " | " |
| X408 | 2SC2235(O,Y) | | | " | " |
| X409 | 2SC2910(S,T) | | | " | Sanyo |
| X410 | 2SC2910(S,T) | | | " | " |
| X411 | 2SA1208(S,T) | | | " | " |
| X412 | 2SA1208(S,T) | | | " | Toshiba |
| X413 | 2SA970(GR,BL) | | | " | " |
| X414 | 2SA970(GR,BL) | | | " | " |
| X415 | 2SC2240(GR,GL) | | | " | " |
| X416 | 2SC2240(GR,BL) | | | Silicon | Toshiba |
| X417 | 2SC2910(S,T) | | | " | Sanyo |
| X418 | 2SA970(GR,BL) | | | " | Toshiba |
| X451 | 2SA970(GR,BL) | | | " | " |
| X452 | 2SC2240(GR,BL) | | | " | " |
| X453 | 2SK246(BL,V) | | | F.E.T. | " |
| X601 | 2SC2240(GR,BL) | | | Silicon | " |
| X602 | 2SC2240(GR,BL) | | | " | " |

**Integrated Circuits**

| Item No. | Part Number | Description | Maker |
|---|---|---|---|
| IC501 | TA7318P(1) | | Toshiba |
| IC601 | TA7317P | | " |

**Diodes**

| Item No. | Part Number | Rating | Description | |
|---|---|---|---|---|
| | | | | Maker |
| D401 | 1SS81 | | Silicon | Hitachi |
| D402 | 1SS81 | | " | " |
| D403 | 1SS81 | | " | " |
| D404 | 1SS81 | | " | " |
| D409 | RD6.2EB3 | | Zener | NEC |
| D410 | RD6.2EB3 | | " | " |
| D411 | RD6.2EB3 | | " | " |
| D412 | RD6.2EB3 | | " | " |
| D413 | 1SS81 | | Silicon | Hitachi |
| D414 | 1SS81 | | " | " |
| D415 | 1SS81 | | " | " |
| D416 | 1SS81 | | " | " |
| D417 | 1S2076-31 | | " | " |
| D418 | 1S2076-31 | | " | " |
| D419 | 1S2076-31 | | " | " |
| D420 | 1S2076-31 | | " | " |
| D451 | 1S2076-31 | | " | " |
| D501 | 1S2076-31 | | " | " |
| D503 | 1S1925 | | " | Dainichi |
| D504 | 1S1925 | | " | " |
| D601 | S2VC20R | | " | Shindengen |
| D602 | S2VC20 | | " | " |

**Capacitors**

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| C401 | QFS81HJ-471 | 470 pF | 50 V | Polystyrene |
| C402 | QFS81HJ-471 | " | " | " |
| C403 | QFS81HJ-471 | " | " | " |
| C404 | QFS81HJ-471 | " | " | " |
| C405 | QFM81HJ-122 | 1200 pF | " | Mylar |
| C406 | QFM81HJ-122 | " | " | " |
| C407 | QFM81HJ-122 | " | " | " |
| C408 | QFM81HJ-122 | " | " | " |
| C409 | EFZ0091-103 | 0.01 μF | " | M. Mylar |
| C410 | EFZ0091-103 | " | " | " |
| C411 | EFZ0091-103 | " | " | " |
| C412 | EFZ0091-103 | " | " | " |
| C413 | QFM81HJ-102 | 1000 pF | " | Mylar |
| C414 | QFM81HJ-102 | " | " | " |
| C415 | QFM81HJ-102 | " | " | " |
| C416 | QFM81HJ-102 | " | " | " |
| C451 | QET52AR-475 | 4.7 μF | 100 V | Electrolytic |
| C452 | QET51ER-226 | 22 μF | 25 V | " |
| C453 | QET52AR-475 | 4.7 μF | 100 V | " |
| C454 | QET51HR-106 | 10 μF | 50 V | " |
| C501 | QFM81HJ-332 | 3300 pF | " | Mylar |
| C502 | QFM81HJ-332 | " | " | " |
| C503 | QEZ0046-105 | 1 μF | " | Non-Pole |
| C504 | QEZ0046-105 | " | " | " |
| C505 | QET51AR-476 | 47 μF | 10 V | Electrolytic |
| C506 | QET51AR-476 | " | " | " |
| C601 | QET51AR-476 | " | " | " |
| C602 | QET51AR-476 | " | " | " |
| C603 | QET51CR-226 | 22 μF | 16 V | " |
| C604 | QFM81HJ-153 | 0.015 μF | 50 V | Mylar |
| C605 | QFM81HJ-222 | 2200 pF | " | " |
| C606 | QET51HR-474 | 0.47 μF | " | Electrolytic |
| C607 | QET51HR-106 | 10 μF | " | " |
| C608 | QET51HR-475 | 4.7 μF | " | " |
| C609 | QET51VR-227 | 220 μF | 35 V | " |
| C610 | QET51VR-227 | " | " | " |

**Resistors**

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| R401 | QRD141J-102S | 1 kΩ | 1/4 W | Carbon |
| R402 | QRD141J-102S | " | " | " |
| R403 | QRD141J-102S | " | " | " |
| R404 | QRD141J-102S | " | " | " |
| R405 | QRD141J-273S | 27 kΩ | " | " |
| R406 | QRD141J-273S | " | " | " |
| R407 | QRD141J-273S | " | " | " |
| R408 | QRD141J-273S | " | " | " |
| R409 | QRD141J-122S | 1.2 kΩ | " | " |
| R410 | QRD141J-122S | " | " | " |
| R411 | QRD141J-122S | " | " | " |
| R412 | QRD141J-122S | " | " | " |
| R413 | QRD141J-821S | 820 Ω | " | " |
| R414 | QRD141J-821S | " | " | " |
| R415 | QRD141J-821S | " | " | " |
| R416 | QRD141J-821S | " | " | " |
| R417 | QRD141J-682S | 6.8 kΩ | " | " |
| R418 | QRD141J-682S | " | " | " |
| R419 | QRD141J-682S | " | " | " |
| R420 | QRD141J-682S | " | " | " |
| R421 | QRZ0052-102 | 1 kΩ | " | Fusible ⚠ |
| R422 | QRZ0052-102 | " | " | " |
| R423 | QRZ0052-102 | " | " | " |
| R424 | QRZ0052-102 | " | " | " |
| R425 | QRD141J-223S | 22 kΩ | " | Carbon |
| R426 | QRD141J-223S | " | " | " |
| R427 | QRD141J-223S | " | " | " |
| R428 | QRD141J-223S | " | " | " |
| R429 | QRD141J-101S | 100 Ω | " | " |
| R430 | QRD141J-101S | " | " | " |
| R431 | QRD141J-101S | " | " | " |
| R432 | QRD141J-101S | " | " | " |
| R433 | QRD141J-682S | 6.8 kΩ | " | " |
| R434 | QRD141J-682S | " | " | " |
| R435 | QRD141J-682S | " | " | " |
| R436 | QRD141J-682S | " | " | " |
| R437 | QRD141J-123S | 12 kΩ | " | " |
| R438 | QRD141J-123S | " | " | " |
| R439 | QRZ0052-150 | 15 Ω | " | Fusible ⚠ |
| R440 | QRZ0052-150 | " | " | " |
| R441 | QRZ0052-150 | " | " | " |
| R442 | QRZ0052-150 | " | " | " |
| R443 | QRD141J-104S | 100 kΩ | " | Carbon |
| R444 | QRD141J-104S | " | " | " |
| R445 | QRD141J-104S | " | " | " |
| R446 | QRD141J-104S | " | " | " |
| R451 | QRZ0052-222 | 2.2 kΩ | " | Fusible ⚠ |
| R452 | QRD141J-103S | 10 kΩ | " | Carbon |
| R453 | QRD141J-223S | 22 kΩ | " | " |
| R454 | QRD148J-224S | 220 kΩ | " | " |
| R455 | QRD141J-333S | 33 kΩ | " | " |
| R456 | QRD141J-471S | 470 Ω | " | " |
| R457 | QRD141J-474S | 470 kΩ | " | " |
| R458 | QRD141J-223S | 22 kΩ | " | " |
| R459 | QRD141J-102S | 1 kΩ | " | " |
| R460 | QRD141J-222S | 2.2 kΩ | " | " |
| R501 | QRD141J-224S | 220 kΩ | " | " |
| R502 | QRD141J-224S | " | " | " |
| R503 | QRD141J-683S | 68 kΩ | " | " |
| R504 | QRD141J-683S | " | " | " |
| R505 | QVP9A0B-471 | 470 Ω | | Variable |
| R506 | QVP9A0B-471 | " | | " |
| R507 | QRD141J-821S | 820 Ω | 1/4 W | Carbon |
| R508 | QRD141J-821S | " | " | " |
| R509 | QRG027J-471 | 470 Ω | 2 W | O.M. Film ⚠ |
| R510 | QRG027J-471 | " | " | " |
| R511 | QRD129J-122 | 1.2 kΩ | 1/2 W | UFN. Carbon ⚠ |
| R512 | QRD129J-560 | 56 Ω | " | " |
| R513 | QRD129J-560 | " | " | " |
| R515 | QRD141J-102S | 1 kΩ | 1/4 W | Carbon |

⚠ : Safety parts



M-L10
No. 2620

Resistors

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| R516 | QRD141J-102S | 1 kΩ | 1/4 W | Carbon |
| R601 | QRD141J-683S | 68 kΩ | " | " |
| R602 | QRD141J-683S | " | " | " |
| R603 | QRD141J-273S | 27 kΩ | " | " |
| R604 | QRD141J-273S | " | " | " |
| R605 | QRD141J-683S | 68 kΩ | " | " |
| R606 | QRD141J-224S | 220 kΩ | " | " |
| R607 | QRD141J-223S | 22 kΩ | " | " |
| R608 | QRD141J-563S | 56 kΩ | " | " |
| R609 | QRD141J-103S | 10 kΩ | " | " |
| R610 | QRD141J-272S | 27 kΩ | " | " |
| R611 | QRD141J-333S | 33 kΩ | " | " |
| R612 | QRD141J-103S | 10 kΩ | " | " |
| R613 | QRD141J-223S | 22 kΩ | " | " |
| R614 | QRD141J-223S | " | " | " |
| R615 | QRD141J-152S | 1.5 kΩ | " | " |
| R616 | QRD141J-152S | " | " | " |
| R617 | QRD141J-473S | 47 kΩ | " | " |
| R618 | QRD141J-124S | 120 kΩ | " | " |
| R620 | QRX017J-1R0 | 1 Ω | 1 W | Metal Film ⚠ |
| R623 | QRD141J-183S | 18 kΩ | 1/4 W | Carbon |
| R624 | QRD129J-102 | 1 kΩ | 1/2 W | UNF. Carbon ⚠ |

⚠ : Safety parts

Others

| Item No. | Part Number | Rating | Description |
|---|---|---|---|
| | E23864-001 | | Circuit Board |
| J201 | E04364-006A | | 6P Socket |
| J202 | E04364-009A | | 9P Socket |
| J203 | E04364-006A | | 6P Socket |
| J204 | E04364-006A | | " |
| J205 | E04364-006A | | " |
| J206 | E04364-009A | | 9P Socket |
| J3 | EWS052-007 | | 2P Socket |
| J4 | EWS053-013 | | 3P Socket |
| P501 | QMV5005-004 | | 4P Plug |
| P502 | QMV5005-003 | | 3P Plug |
| P503 | QMV5005-006 | | 6P Plug |
| P504 | QMV5005-005 | | 5P Plug |
| P601 | QMV5005-005 | | " |
| RY501 | ESK2D24-213 | | Relay |
| RY502 | ESK2D24-213 | | " |
| RY503 | ESK1D24-115 | | " |

# 3-(2) TXX-350□ AC Unit P.C. Board Ass'y

**Note:** TXX-350□-1 varies according to areas employed. See note (1) when placing an order.

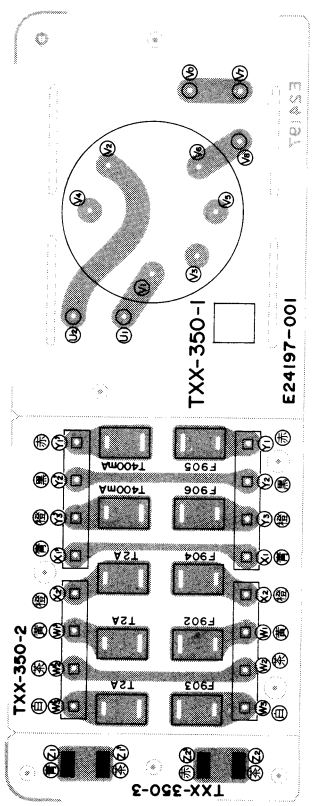



Fig. 6

Note (1):

| Designated Areas | P.C. Board Ass'y |
|---|---|
| Europe & U.K. | TXX-350Ⓑ-1 |
| U.S.A. & Other Areas | TXX-350Ⓐ-1 |

Note (2): The symbols ( 赤、黒、白 ····· etc.) on P.C. Board surface are factory process only.

Others

| Item No. | Part Number | Rating | Description |
|---|---|---|---|
| | E24197-001 | | Circuit Board |
| | QSR0085-001 | | Rotary Switch (Voltage Selector)⚠ |
| | E67764-104 | | Terminal |
| | E43727-002 | | Tab |
| | E65508-002 | | Tab (for B only) |
| | EMG7331-001 | | Fuse Clip |
| | E61380-011 | | Fuse Label (2 A/125 V) for Ⓐ only |
| | E61380-029 | | Fuse Label (1.25 A/125 V) for Ⓐ only |
| J901 | EWS053-014 | | 3P Socket |
| P009 | EWS112-003 | | 2P Plug |
| P901 | EWS062-008 | | " |
| P902 | EWS063-014 | | 3P Plug |

# 3-(3) TXX-344□ Power Supply P.C. Board Ass'y

**Note:** TXX-344□-1 varies according to areas employed. See note (1) when placing an order.

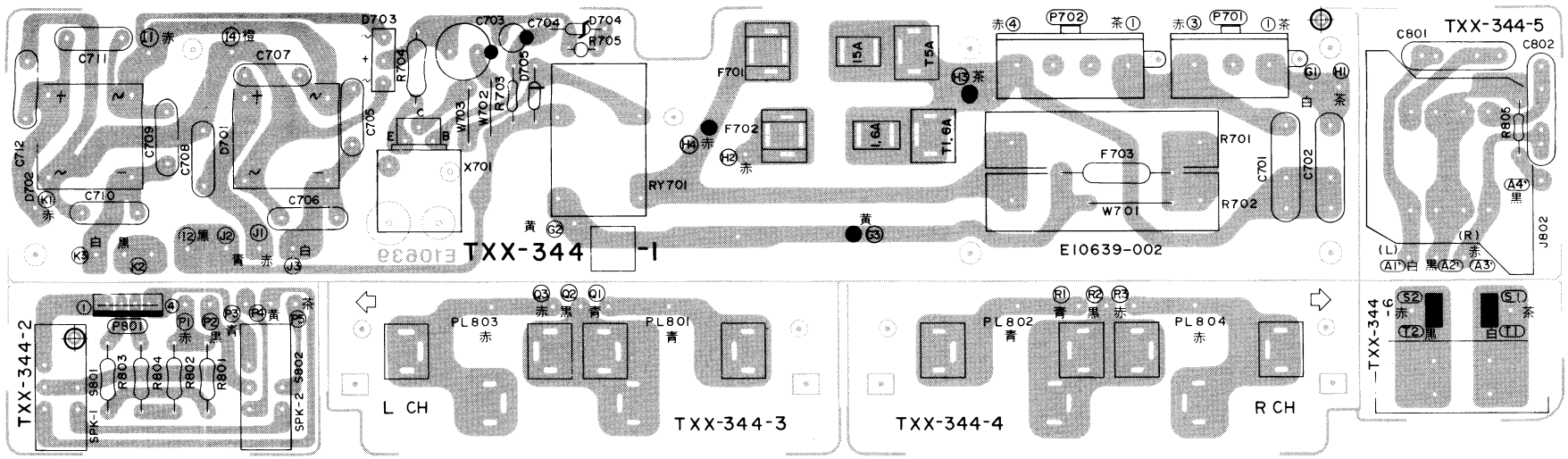



Fig. 7

### Transistor

| Item No. | Part Number | Rating | Description | |
|---|---|---|---|---|
| | | | | Maker |
| X701 | 2SB536(L,M) | | Silicon | NEC |

### Diodes

| Item No. | Part Number | Rating | Description | |
|---|---|---|---|---|
| | | | | Maker |
| D701 | PB102F-6 | | Silicon | Nippon Inter |
| D702 | PB102F-6 | | " | " |
| D703 | S2VC20 | | " | Shindengen |
| D704 | RD4.7EB2 | | Zener | NEC |
| D705 | 1S2076-31 | | Silicon | Hitachi |

### Thermistor

| Item No. | Part Number | Rating | Description | |
|---|---|---|---|---|
| | | | | Maker |
| R705 | SDT35 | | | Sanyo |

### Capacitors

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| C701 | QFZ9010-103 | 0.01 μF | 250 V | M. Mylar |
| C702 | QFZ9010-103 | " | " | " |
| C703 | QET52AR-476 | 47 μF | 100 V | Electrolytic |
| C704 | QET51CR-226 | 22 μF | 16 V | " |
| C801 | QFZ0074-104 | 0.1 μF | 250 V | M. Mylar |
| C802 | QFZ0074-104 | " | " | " |

### Resistors

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| R701 | QRF106K-6R8M | 6.8 Ω | 10 W | Cement ⚠ |
| R702 | QRF106K-6R8M | " | " | " |
| R703 | QRD148J-393S | 39 kΩ | 1/4 W | Carbon |
| R704 | QRD129J-121 | 120 Ω | 1/2 W | UNF. Carbon ⚠ |
| R801 | QRD129J-560 | 56 Ω | " | " |
| R802 | QRD129J-560 | " | " | " |
| R803 | QRD129J-560 | " | " | " |
| R804 | QRD129J-560 | " | " | " |

⚠ : Safety parts

### Others

| Item No. | Part Number | Rating | Description |
|---|---|---|---|
| | E10639-002 | | Circuit Board |
| | EWS112-003 | | 2P Plug |
| | EWS102-002 | | 2P Socket |
| | QMC0231-004 | | AC Outlet (for B only) ⚠ |
| | E45524-002 | | Fuse Clip |
| | SBSB3008M | | Screw |
| | SBSB3012M | | " |
| | E61537-001 | | Heat Sink |
| J802 | EMN00TP-402A | | Pin Jack (Input) |
| P701 | E04362-003 | | 3P Plug (AC) |
| P702 | E04362-004 | | 4P Plug (Push Switch) |
| P801 | QMV5005-004 | | 4P Plug |
| S801 | QSP0210-103 | | Push Switch (Speakers) |
| S802 | QSP0210-103 | | " ( " ) |
| RY701 | ESK1D24-113 | | Relay |

⚠ : Safety parts

### Note (1):

| Designated Areas | P.C. Board Ass'y |
|---|---|
| Europe & U.K. | TXX-344D-1 |
| U.S.A. & Other Areas | TXX-344B-1 |

### Note (2):

The symbols ( 赤、黒、白 ····· etc.) on P.C. Board surface are factory process only.

## 3-(4) TAP-292A Drive Amp. P.C. Board Ass'y

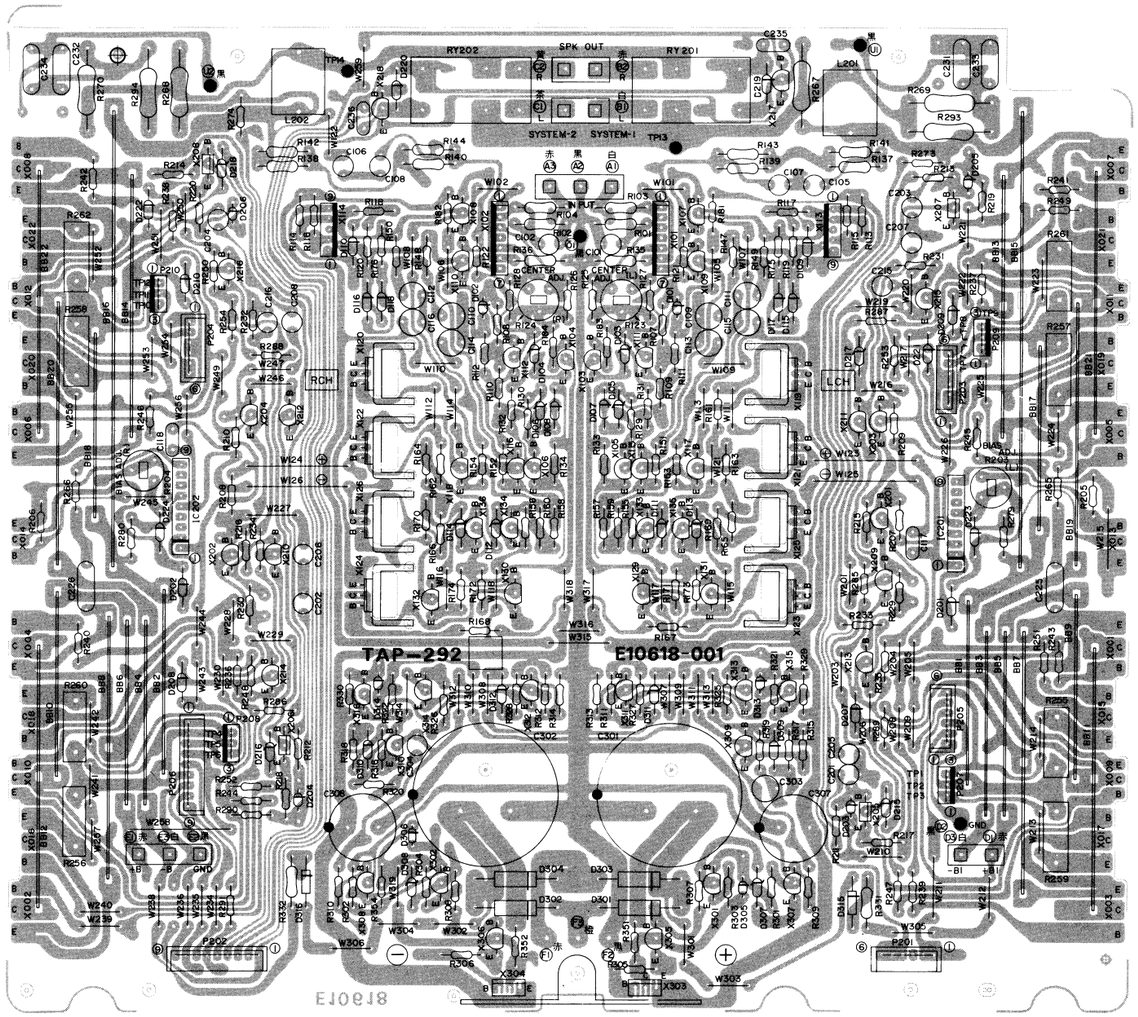



Fig. 8

**Note:** The symbols ( 赤、黒、白 ····· etc.) on P.C. Board surface are factory process only.

### Transistors

| Item No. | Part Number | Rating | Description | |
|---|---|---|---|---|
| | | | | Maker |
| X101 | 2SK150A(BL) | | F.E.T. | Toshiba |
| X102 | 2SK150A(BL) | | " | " |
| X103 | 2SA1084(D,E) | | Silicon | Hitachi |
| X104 | 2SA1084(D,E) | | " | " |
| X105 | 2SC2910(S,T) | | " | Sanyo |
| X106 | 2SC2910(S,T) | | " | " |
| X107 | 2SC2910(S,T) | | " | " |
| X108 | 2SC2910(S,T) | | " | " |
| X109 | 2SC2910(S,T) | | " | " |
| X110 | 2SC2910(S,T) | | " | " |
| X111 | 2SA1084(D,E) | | " | Hitachi |
| X112 | 2SA1084(D,E) | | " | " |
| X113 | UPA75V(P,F) | | " | NEC |
| X114 | UPA75V(P,F) | | " | " |
| X115 | 2SA1084(D,E) | | " | Hitachi |



### Transistors

| Item No. | Part Number | Rating | Description | |
|---|---|---|---|---|
| | | | | Maker |
| X116 | 2SA1084(D,E) | | Silicon | Hitachi |
| X117 | 2SA1084(D,E) | | " | " |
| X118 | 2SA1084(D,E) | | " | " |
| X119 | 2SA1210(S,T) | | " | Sanyo |
| X120 | 2SA1210(S,T) | | " | " |
| X121 | 2SA1210(S,T) | | " | " |
| X122 | 2SA1210(S,T) | | " | " |
| X123 | 2SA1210(S,T) | | " | " |
| X124 | 2SA1210(S,T) | | " | " |
| X125 | 2SC2912(S,T) | | " | " |
| X126 | 2SC2912(S,T) | | " | " |
| X129 | 2SC2546(E,F) | | " | Hitachi |
| X130 | 2SC2546(E,F) | | " | " |
| X131 | 2SC2546(E,F) | | " | " |
| X132 | 2SC2546(E,F) | | " | " |
| X133 | 2SC2546(E,F) | | " | " |
| X134 | 2SC2546(E,F) | | " | " |
| X135 | 2SA1084(D,E) | | " | " |
| X136 | 2SA1084(D,E) | | " | " |
| X201 | 2SC2240(GR,BL) | | " | Toshiba |
| X202 | 2SC2240(GR,BL) | | " | " |
| X203 | 2SA970(GR,BL) | | " | " |
| X204 | 2SA970(GR,BL) | | " | " |
| X205 | 2SA1210(S,T) | | " | Sanyo |
| X206 | 2SA1210(S,T) | | " | " |
| X207 | 2SC2912(S,T) | | " | " |
| X208 | 2SC2912(S,T) | | " | " |
| X209 | 2SA1084(D,E) | | " | Hitachi |
| X210 | 2SA1084(D,E) | | " | " |
| X211 | 2SC2240(GR,BL) | | " | Toshiba |
| X212 | 2SC2240(GR,BL) | | " | " |
| X213 | 2SC2235(O,Y) | | " | " |
| X214 | 2SC2235(O,Y) | | " | " |
| X215 | 2SA965(O,Y) | | " | " |
| X216 | 2SA965(O,Y) | | " | " |
| X217 | 2SC2240(GR,BL) | | " | " |
| X218 | 2SC2240(GR,BL) | | " | " |
| X301 | 2SA1084(D,E) | | " | Hitachi |
| X302 | 2SC2546(E,F) | | " | " |
| X303 | 2SD669A(B,C) | | " | " |
| X304 | 2SB649(B,C) | | " | " |
| X305 | 2SC2546(E,F) | | " | " |
| X306 | 2SA1084(D,E) | | " | " |
| X307 | 2SA872AV(D,E) | | " | " |
| X308 | 2SC1775AV(E,F) | | " | " |
| X309 | 2SA1084(D,E) | | " | " |
| X310 | 2SC2546(E,F) | | " | " |
| X311 | 2SC2546(E,F) | | " | " |
| X312 | 2SC2546(E,F) | | " | " |
| X313 | 2SA1084(D,E) | | " | " |
| X314 | 2SA1084(D,E) | | " | " |
| X315 | 2SC2240(GR,BL) | | " | Toshiba |
| X316 | 2SA970(GR,BL) | | " | " |

### Integrated Circuits

| Item No. | Part Number | Rating | Description | |
|---|---|---|---|---|
| | | | | Maker |
| IC201 | VC5022(X,Y) | | | Rōhm |
| IC202 | VC5022(X,Y) | | | " |

### Diodes

| Item No. | Part Number | Rating | Description | |
|---|---|---|---|---|
| | | | | Maker |
| D101 | VD1220 | | Silicon | NEC |
| D102 | VD1220 | | " | " |
| D103 | HZ6B1L | | Zener | Hitachi |
| D104 | HZ6B1L | | " | " |
| D105 | HZ6B1L | | " | " |
| D106 | HZ6B1L | | " | " |
| D107 | 1S2076-31 | | Silicon | " |
| D108 | 1S2076-31 | | " | " |
| D109 | 1S2076-31 | | " | " |
| D110 | 1S2076-31 | | " | " |
| D111 | HZ3ALL | | Zener | " |
| D112 | HZ3ALL | | " | " |
| D113 | HZ3ALL | | " | " |
| D114 | HZ3ALL | | " | " |
| D115 | 1S2076-31 | | Silicon | " |
| D116 | 1S2076-31 | | " | " |
| D117 | 1S2076-31 | | " | " |
| D118 | 1S2076-31 | | " | " |
| D201 | 1S2076-31 | | " | " |
| D202 | 1S2076-31 | | " | " |
| D203 | VD1220 | | " | NEC |
| D204 | VD1220 | | " | " |
| D205 | VD1220 | | " | " |
| D206 | VD1220 | | " | " |
| D207 | 1SS81 | | " | Hitachi |
| D208 | 1SS81 | | " | " |
| D209 | 1SS81 | | " | " |
| D210 | 1SS81 | | " | " |
| D215 | RD4.7EB2 | | Zener | NEC |
| D216 | RD4.7EB2 | | " | " |
| D217 | RD4.7EB2 | | " | " |
| D218 | RD4.7EB2 | | " | " |
| D219 | 1S2076-31 | | Silicon | Hitachi |
| D220 | 1S2076-31 | | " | " |
| D221 | 1S2076-31 | | " | " |
| D222 | 1S2076-31 | | " | " |
| D223 | 1S2076-31 | | " | " |
| D224 | 1S2076-31 | | " | " |
| D301 | 30DF2FA-2 | | " | Nippon Inter |
| D302 | 30DF2FA-2 | | " | " |
| D303 | 30DF2FA-2 | | " | " |
| D304 | 30DF2FA-2 | | " | " |
| D305 | VD1220 | | " | NEC |
| D306 | VD1220 | | " | " |
| D307 | HZ6C1L | | Zener | Hitachi |
| D308 | HZ6C1L | | " | " |
| D309 | 1S2076-31 | | Silicon | " |
| D310 | 1S2076-31 | | " | " |
| D311 | HZ6C1L | | Zener | " |
| D312 | HZ6C1L | | " | " |
| D313 | VD1220 | | Silicon | NEC |
| D314 | VD1220 | | " | " |
| D315 | 10DF2FD | | " | Nippon Inter |
| D316 | 10DF2FD | | " | " |

### Coils

| Item No. | Part Number | Rating | Description |
|---|---|---|---|
| L201 | E04059-R68 | 0.68 μH | Choke Coil |
| L202 | E04059-R68 | " | " |

## Capacitors

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| C101 | QFS81HJ-471 | 470 pF | 50 V | Polystyrene |
| C102 | QFS81HJ-471 | " | " | " |
| C105 | QFS82BJ-121 | 120 pF | 125 V | " |
| C106 | QFS82BJ-121 | " | " | " |
| C107 | QFS82BJ-151 | 150 pF | " | " |
| C108 | QFS82BJ-151 | " | " | " |
| C109 | QFS81HJ-332 | 3300 pF | 50 V | " |
| C110 | QFS81HJ-332 | " | " | " |
| C111 | QFS81HJ-332 | " | " | " |
| C112 | QFS81HJ-332 | " | " | " |
| C113 | QFS81HJ-472 | 4700 pF | " | " |
| C114 | QFS81HJ-472 | " | " | " |
| C115 | QFS81HJ-472 | " | " | " |
| C116 | QFS81HJ-472 | " | " | " |
| C117 | QFM41HJ-392N | 3900 pF | " | Mylar |
| C118 | QFM41HJ-392N | " | " | " |
| C201 | QFS82BJ-560 | 56 pF | 125 V | Polystyrene |
| C202 | QFS82BJ-560 | " | " | " |
| C203 | QFS82BJ-680 | 68 pF | " | " |
| C204 | QFS82BJ-680 | " | " | " |
| C205 | QFS82BJ-470 | 47 pF | " | " |
| C206 | QFS82BJ-470 | " | " | " |
| C207 | QFS82BJ-680 | 68 pF | " | " |
| C208 | QFS82BJ-680 | " | " | " |
| C215 | QFS82BJ-560 | 56 pF | " | " |
| C216 | QFS82BJ-560 | " | " | " |
| C225 | EFZ0091-473 | 0.047 μF | 50 V | M. Mylar |
| C226 | EFZ0091-473 | " | " | " |
| C231 | EFZ0091-223 | 0.022 μF | " | " |
| C232 | EFZ0091-223 | " | " | " |
| C233 | EFZ0091-223 | " | " | " |
| C234 | EFZ0091-223 | " | " | " |
| C235 | QFM81HJ-273 | 0.027 μF | " | Mylar |
| C236 | QFM81HJ-273 | " | " | " |
| C301 | EEZ1003-827 | 820 μF | 100 V | Electrolytic |
| C302 | EEZ1003-827 | " | " | " |
| C303 | QFS81HJ-222 | 2200 pF | 50 V | Polystyrene |
| C304 | QFS81HJ-222 | " | " | " |
| C307 | EEZ1002-475 | 4.7 μF | 100 V | Electrolytic |
| C308 | EEZ1002-475 | " | " | " |

## Resistors

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| R101 | QRV121F-1003 | 100 kΩ | 1/2W | Metal Film ⚠ |
| R102 | QRV121F-1003 | " | " | " |
| R103 | QRV121F-3300 | 330 Ω | " | " |
| R104 | QRV121F-3300 | " | " | " |
| R107 | QRD141J-473S | 47 kΩ | 1/4W | Carbon |
| R108 | QRD141J-473S | " | " | " |
| R109 | QRD141J-473S | " | " | " |
| R110 | QRD141J-473S | " | " | " |
| R111 | QRZ0052-271 | 270 Ω | " | Fusible ⚠ |
| R112 | QRZ0052-271 | " | " | " |
| R113 | QRZ0052-561 | 560 Ω | " | " |
| R114 | QRZ0052-561 | " | " | " |
| R115 | QRZ0052-561 | " | " | " |
| R116 | QRZ0052-561 | " | " | " |
| R117 | QRD141J-223S | 22 kΩ | " | Carbon |
| R118 | QRD141J-223S | " | " | " |
| R119 | QRD141J-223S | " | " | " |
| R120 | QRD141J-223S | " | " | " |
| R121 | QRZ0052-681 | 680 Ω | " | Fusible ⚠ |
| R122 | QRZ0052-681 | " | " | " |
| R123 | QVZ3501-101 | 100 Ω | | Variable |
| R124 | QVZ3501-101 | " | | " |
| R125 | QRD149J-220S | 22 Ω | 1/4W | UNF. Carbon ⚠ |
| R126 | QRD149J-220S | " | " | " |
| R127 | QRD149J-220S | " | " | " |

⚠ : Safety parts

## Resistors

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| R128 | QRD149J-220S | 22 Ω | 1/4W | UNF. Carbon ⚠ |
| R129 | QRZ0052-102 | 1 kΩ | " | Fusible ⚠ |
| R130 | QRZ0052-102 | " | " | " |
| R131 | QRZ0052-222 | 2.2 kΩ | " | " |
| R132 | QRZ0052-222 | " | " | " |
| R133 | QRZ0052-102 | 1 kΩ | " | " |
| R134 | QRZ0052-102 | " | " | " |
| R135 | QRV121F-1500 | 150 Ω | 1/2W | Metal Film ⚠ |
| R136 | QRV121F-1500 | " | " | " |
| R137 | QRD129J-562 | 5.6 kΩ | " | UNF. Carbon ⚠ |
| R138 | QRD129J-562 | " | " | " |
| R139 | QRD129J-562 | " | " | " |
| R140 | QRD129J-562 | " | " | " |
| R141 | QRD129J-562 | " | " | " |
| R142 | QRD129J-562 | " | " | " |
| R143 | QRD129J-562 | " | " | " |
| R144 | QRD129J-562 | " | " | " |
| R147 | QRD141J-120S | 12 Ω | 1/4W | Carbon |
| R148 | QRD141J-120S | " | " | " |
| R149 | QRD141J-120S | " | " | " |
| R150 | QRD141J-120S | " | " | " |
| R151 | QRD141J-221S | 220 Ω | " | " |
| R152 | QRD141J-221S | " | " | " |
| R153 | QRD141J-221S | " | " | " |
| R154 | QRD141J-221S | " | " | " |
| R155 | QRZ0052-101 | 100 Ω | " | Fusible ⚠ |
| R156 | QRZ0052-101 | " | " | " |
| R157 | QRZ0052-270 | 27 Ω | " | " |
| R158 | QRZ0052-270 | " | " | " |
| R159 | QRZ0052-270 | " | " | " |
| R160 | QRZ0052-270 | " | " | " |
| R161 | QRZ0052-102 | 1 kΩ | " | " |
| R162 | QRZ0052-102 | " | " | " |
| R163 | QRD141J-473S | 47 kΩ | " | Carbon |
| R164 | QRD141J-473S | " | " | " |
| R165 | QRD141J-473S | " | " | " |
| R166 | QRD141J-473S | " | " | " |
| R167 | QRZ0052-272 | 2.7 kΩ | " | Fusible ⚠ |
| R168 | QRZ0052-272 | " | " | " |
| R169 | QRZ0052-471 | 470 Ω | " | " |
| R170 | QRZ0052-471 | " | " | " |
| R171 | QRZ0052-221 | 220 Ω | " | " |
| R172 | QRZ0052-221 | " | " | " |
| R173 | QRZ0052-221 | " | " | " |
| R174 | QRZ0052-221 | " | " | " |
| R175 | QRZ0052-330 | 33 Ω | " | " |
| R176 | QRZ0052-330 | " | " | " |
| R181 | QRZ0052-681 | 680 Ω | " | " |
| R182 | QRZ0052-681 | " | " | " |
| R203 | QVZ3501-221 | 220 Ω | | Variable |
| R204 | QVZ3501-221 | " | | " |
| R205 | QRD149J-681S | 680 Ω | 1/4W | U. Carbon ⚠ |
| R206 | QRD149J-681S | " | " | " |
| R207 | QRZ0052-331 | 330 Ω | " | Fusible ⚠ |
| R208 | QRZ0052-331 | " | " | " |
| R209 | QRZ0052-331 | " | " | " |
| R210 | QRZ0052-331 | " | " | " |
| R211 | QRD141J-473S | 47 kΩ | " | Carbon |
| R212 | QRD141J-473S | " | " | " |
| R213 | QRD141J-473S | " | " | " |
| R214 | QRD141J-473S | " | " | " |
| R215 | QRZ0052-561 | 560 Ω | " | Fusible ⚠ |
| R216 | QRZ0052-561 | " | " | " |
| R217 | QRZ0052-101 | 100 Ω | " | " |
| R218 | QRZ0052-101 | " | " | " |
| R219 | QRZ0052-101 | " | " | " |
| R220 | QRZ0052-101 | " | " | " |
| R229 | QRZ0052-151 | 150 Ω | " | " |
| R230 | QRZ0052-151 | " | " | " |
| R231 | QRZ0052-101 | 100 Ω | " | " |

⚠ : Safety parts

## Resistors

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| R232 | QRZ0052-101 | 100 Ω | 1/4W | Fusible ⚠ |
| R233 | QRZ0052-680 | 68 Ω | " | " |
| R234 | QRZ0052-680 | " | " | " |
| R235 | QRZ0052-330 | 33 Ω | " | " |
| R236 | QRZ0052-330 | " | " | " |
| R237 | QRZ0052-330 | " | " | " |
| R238 | QRZ0052-330 | " | " | " |
| R239 | QRZ0052-270 | 27 Ω | " | " |
| R240 | QRZ0052-270 | " | " | " |
| R241 | QRZ0052-270 | " | " | " |
| R242 | QRZ0052-270 | " | " | " |
| R243 | QRZ0052-270 | " | " | " |
| R244 | QRZ0052-270 | " | " | " |
| R245 | QRZ0052-270 | " | " | " |
| R246 | QRZ0052-270 | " | " | " |
| R247 | QRZ0051-4R7 | 4.7 Ω | " | " |
| R248 | QRZ0051-4R7 | " | " | " |
| R249 | QRZ0051-4R7 | " | " | " |
| R250 | QRZ0051-4R7 | " | " | " |
| R251 | QRZ0051-4R7 | " | " | " |
| R252 | QRZ0051-4R7 | " | " | " |
| R253 | QRZ0051-4R7 | " | " | " |
| R254 | QRZ0051-4R7 | " | " | " |
| R255 | ERF027J-R22 | 0.22 Ω | 2W | Cement ⚠ |
| R256 | ERF027J-R22 | " | " | " |
| R257 | ERF027J-R22 | " | " | " |
| R258 | ERF027J-R22 | " | " | " |
| R259 | ERF027J-R22 | " | " | " |
| R260 | ERF027J-R22 | " | " | " |
| R261 | ERF027J-R22 | " | " | " |
| R262 | ERF027J-R22 | " | " | " |
| R265 | QRZ0051-2R2 | 2.2 Ω | 1/4W | Fusible ⚠ |
| R266 | QRZ0051-2R2 | " | " | " |
| R267 | QRX027J-100 | 10 Ω | 2W | O.M. Film ⚠ |
| R268 | QRX027J-100 | " | " | " |
| R269 | QRX027J-100 | " | " | " |
| R270 | QRX027J-100 | " | " | " |
| R273 | QRZ0052-470 | 47 Ω | 1/4W | Fusible ⚠ |
| R274 | QRZ0052-470 | " | " | " |
| R279 | QRZ0052-471 | 470 Ω | " | " |
| R280 | QRZ0052-471 | " | " | " |
| R285 | QRZ0052-100 | 10 Ω | " | " |
| R286 | QRZ0052-100 | " | " | " |
| R287 | QRZ0052-100 | " | " | " |
| R288 | QRZ0052-100 | " | " | " |
| R289 | QRZ0052-330 | 33 Ω | " | " |
| R290 | QRZ0052-330 | " | " | " |
| R291 | QRD141J-471S | 470 Ω | " | Carbon |
| R293 | QRX027J-100 | 10 Ω | 2W | O.M. Film ⚠ |
| R294 | QRX027J-100 | " | " | " |
| R301 | QRD141J-563S | 56 kΩ | 1/4W | Carbon |
| R302 | QRD141J-563S | " | " | " |
| R303 | QRD149J-221S | 220 Ω | " | UNF. Carbon ⚠ |
| R304 | QRD149J-221S | " | " | " |
| R305 | QRZ0052-331 | 330 Ω | " | Fusible ⚠ |
| R306 | QRZ0052-331 | " | " | " |
| R307 | QRD149J-181S | 180 Ω | " | UNF. Carbon ⚠ |
| R308 | QRD149J-181S | " | " | " |
| R309 | QRD149J-221S | 220 Ω | " | " |
| R310 | QRD149J-221S | " | " | " |
| R311 | QRD141J-473S | 47 kΩ | " | Carbon |
| R312 | QRD141J-473S | " | " | " |
| R313 | QRZ0052-432 | 4.3 kΩ | " | Fusible ⚠ |
| R314 | QRZ0052-432 | " | " | " |
| R315 | QRD149J-221S | 220 Ω | " | UNF. Carbon ⚠ |
| R316 | QRD149J-221S | " | " | " |
| R317 | QRD149J-22S | " | " | " |
| R318 | QRD149J-221S | " | " | " |
| R319 | QRD141J-470S | 47 Ω | " | Carbon |
| R320 | QRD141J-470S | " | " | " |

⚠ : Safety parts

## Resistors

| Item No. | Part Number | Rating | | Description |
|---|---|---|---|---|
| R321 | QRD149J-221S | 220 Ω | 1/4W | UNF. Carbon ⚠ |
| R322 | QRD149J-221S | " | " | " |
| R325 | QRD149J-101S | 100 Ω | " | " |
| R326 | QRD149J-101S | " | " | " |
| R327 | QRD141J-473S | 47 kΩ | " | Carbon |
| R328 | QRD141J-473S | " | " | " |
| R329 | QRD141J-563S | 56 kΩ | " | " |
| R330 | QRD141J-563S | " | " | " |
| R331 | QRD129J-150 | 15 Ω | 1/2W | UNF. Carbon ⚠ |
| R332 | QRD129J-150 | " | " | " |
| R351 | QRZ0052-4R7 | 4.7 Ω | 1/4W | Fusible ⚠ |
| R352 | QRZ0052-4R7 | " | " | " |
| R354 | QRD149J-332S | 3.3 kΩ | " | UNF. Carbon ⚠ |

⚠ : Safety parts

## Others

| Item No. | Part Number | Rating | Description |
|---|---|---|---|
| | E10618-001 | | Circuit Board |
| | E67764-102 | | Terminal |
| | E67764-103 | | " |
| | E301690-001 | | Bus Bar |
| | E68474-001 | | " |
| | E68475-001 | | " |
| | WNS3000 | | Washer |
| | LPSP3008M | | Screw |
| | SPSP3008M | | " |
| | E60171-005 | | Heat Sink |
| | E68561-001 | | " |
| P201 | E04363-006 | | 6P Plug |
| P202 | E04363-009 | | 9P Plug |
| P203 | E04363-006 | | 6P Plug |
| P204 | E04363-006 | | " |
| P205 | E04363-006 | | " |
| P206 | E04363-009 | | 9P Plug |
| P207 | QMV5005-003 | | 3P Plug |
| P208 | QMV5005-003 | | " |
| P209 | QMV5005-003 | | " |
| P210 | QMV5005-003 | | " |
| P6 | EWS063-012 | | " |
| RY201 | ESK5D24-214 | | Relay |
| RY202 | ESK5D24-214 | | " |

# 4. Packing Materials and Part Numbers

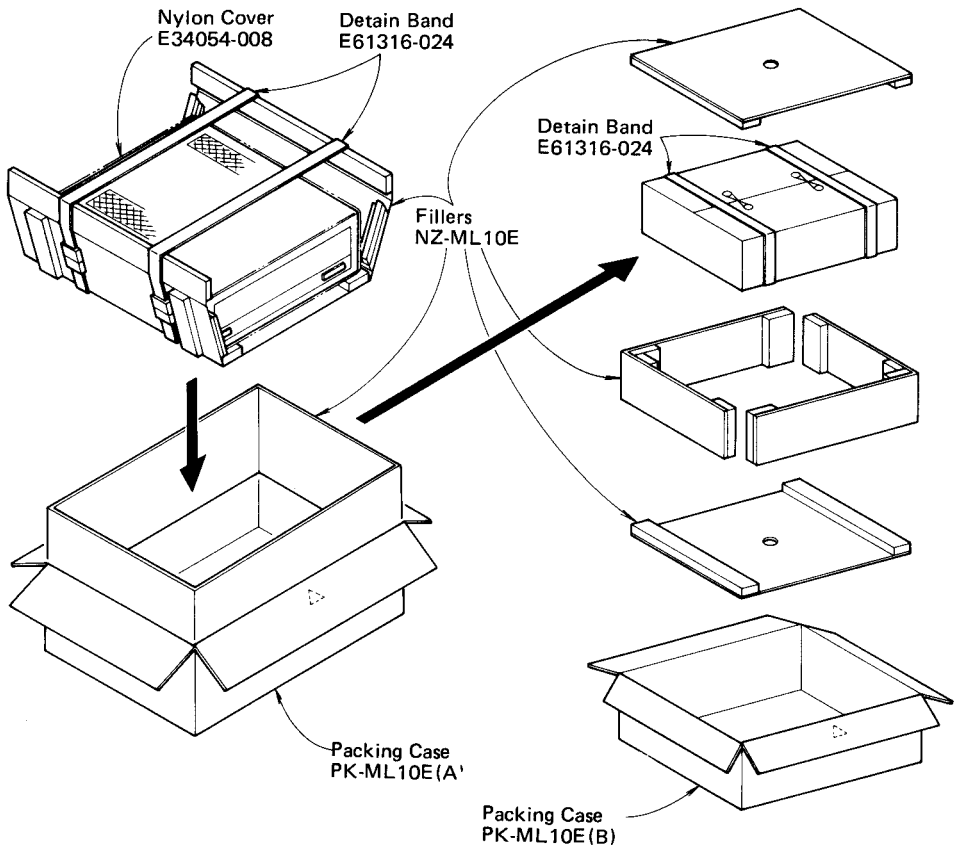



Fig. 9

# 5. Accessories List

| Description | U.S.A. | Europe | U.K. | Other Countries |
|---|---|---|---|---|
| Instruction Book | E30580-934A | E30580-934A | E30580-934A | E30580-934A |
| " (Dutch & Spanish) | – | E30580-1049A | – | E30580-1049A |
| Warranty Card | BT20048 | – | BT20013C | – |
| Polishing Cloth | E65660-001 | E65660-001 | E65660-001 | E65660-001 |
| Service Information Card | BT20046 | – | – | – |
| Safety Instruction Sheet | BT20044D | – | – | – |
| Fuse Primary ⚠ | – | – | – | QMF61M1-120 (110/120 V, 12 A) or QMF61U1-6R0 (220/240 V, 6 A) |
| Fuse Label | – | – | – | E66188-030 (12 A) or E66188-017 (6 A) |
| Free-Up Belt | E03709-001 | E03709-001 | E03709-001 | E03709-001 |
| Envelope (for Instruction Book) | E41202-2 | E41202-2 | E41202-2 | E41202-2 |
| " (for Warranty Card) | E66416-003 | – | – | – |
| " (for Fuse) | – | – | – | E41202-1 |
| " (for Power Cord) | QPGA012-03505 | QPGA012-03505 | QPGA012-03505 | QPGA012-03505 |

⚠ : Safety parts

# 6. Parts List with Specified Numbers for Designated Areas

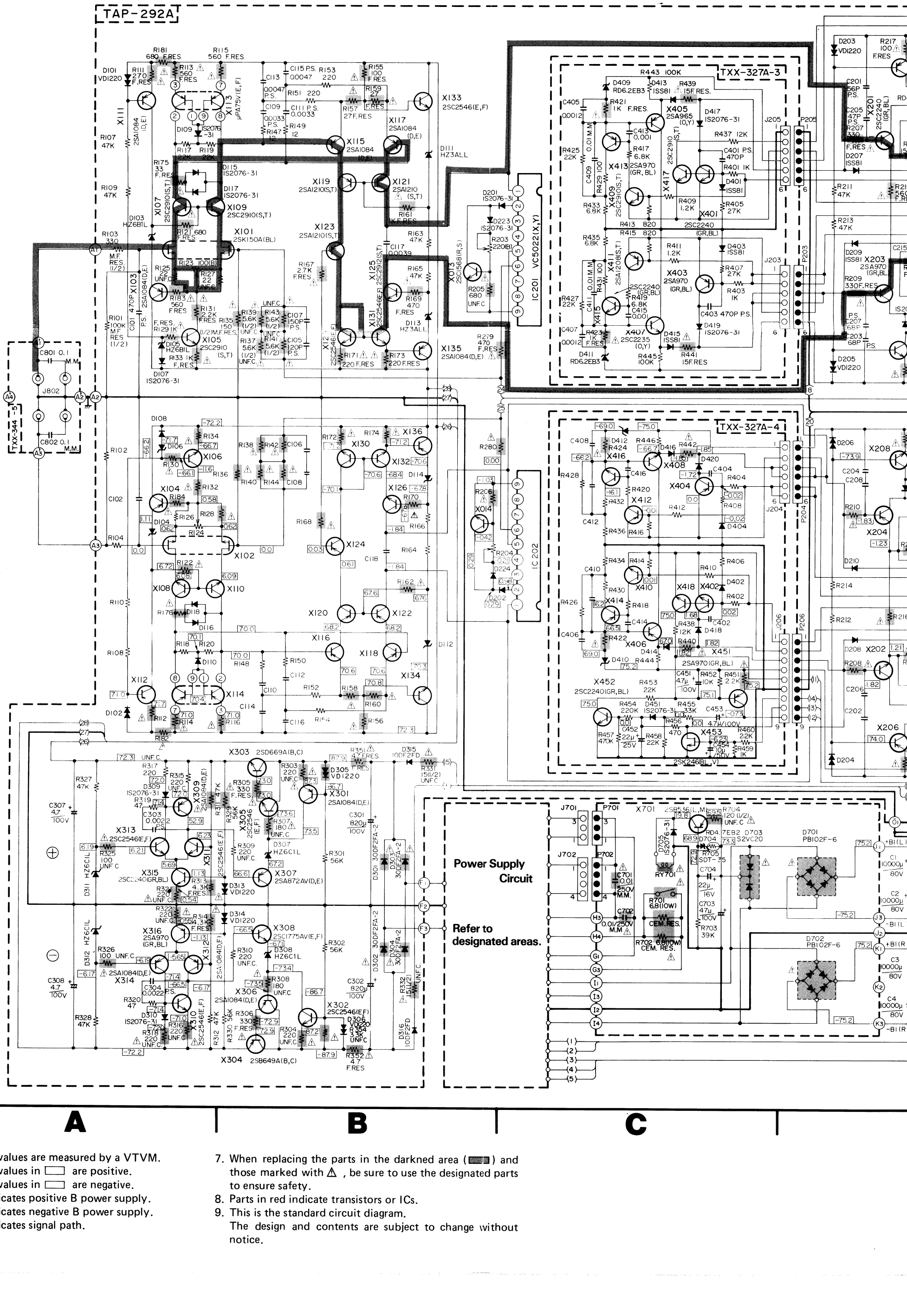
| Description | U.S.A. | Europe | U.K. | Other Countries |
|---|---|---|---|---|
| Power Switch ⚠ | QSP1110-310 | QSP1106-002 | QSP1106-002 | QSP1106-002 |
| Switch Cover ⚠ | – | E67520-002 | E67520-002 | – |
| Power Cord ⚠ | QMP1700-244 | QMP4400-200 (for Swiss) QMP4100-200 (for Others) | QMP9017-008 | QMP1700-244 |
| Siemens Plug ⚠ | – | – | – | E04056 |
| AC Outlet ⚠ | QMC0231-004 | – | – | QMC0231-004 |
| Mask Plate for AC Outlet | – | E66863-002 | E66863-002 | – |
| AC Cover for TXX-350-3 | – | E69529-001 | E69529-001 | – |
| Fuse P.C. Board Holder | – | E47275-003 | E47275-003 | – |
| Fuse Socket ⚠ | QMG0201-003 | QMG0301-003 | QMG0301-003 | QMG0201-003 |
| Fuse Cover ⚠ | – | E69291-001 | E69291-001 | – |
| Fuse Primary (F001) ⚠ | QMF61M1-120 (120 V, 12 A) | QMF51A2-5R0S (220 V, T5 A) | QMF51A2-5R0S (240 V, T5 A) | QMF61M1-120 (110/120 V, 12 A) or QMF61U1-6R0 (220/240 V, 6 A) |
| Fuse Secondary (F902, 903) ⚠ | QMF51U1-2R0S (2A) | QMF51A2-2R0L (T2A) | QMF51A2-2R0L (T2A) | QMF51U1-2R0S (2A) |
| Fuse Secondary (F904) ⚠ | QMF51U1-2R0S (2A) | QMF51A2-2R0L (T2A) | QMF51A2-2R0L (T2A) | QMF51U1-2R0S (2A) |
| Fuse Secondary (F905, 906) ⚠ | QMF51U1-1R25S (1.25 A) | QMF51A2-R40L (T400 mA) | QMF51A2-R40L (T400 mA) | QMF51U1-1R25S (1.25 A) |
| Mask Plate for Voltage Selector | E66196-001 | E66196-001 | E66196-001 | – |
| Cover for TXX-350-1 | – | E69528-001 | E69528-001 | – |
| Rating Plate | – | E66860-027 | E66860-028 | E66860-037 |
| AC Unit P.C. Board Ass'y | TXX-350A | TXX-350B | TXX-350B | TXX-350A |
| Power Supply P.C. Board Ass'y | TXX-344B | TXX-344D | TXX-344D | TXX-344B |
| Rear Cover | E23896-002 | E23896-003 | E23896-003 | E23896-002 |

⚠ : Safety Parts

JVC

VICTOR COMPANY OF JAPAN, LIMITED, TOKYO, JAPAN

# M-L10 Schematic Diagram




**Notes:**

1. Voltage values are measured by a VTVM.
2. Voltage values in ▭ are positive.
3. Voltage values in ▭ are negative.
4. —— indicates positive B power supply.
5. —— indicates negative B power supply.
6. ▬ indicates signal path.
7. When replacing the parts in the darkned area (▬) and those marked with ⚠ , be sure to use the designated parts to ensure safety.
8. Parts in red indicate transistors or ICs.
9. This is the standard circuit diagram.
   The design and contents are subject to change without notice.

C D E F
1 2 3 4
TXX-327A-3
TXX-327A-4
TXX-327A-1
TXX-327A-2
TXX-344-2
METER
IC501 TA7318P(1)
HOLD & AMP.
4/1 COMP
DET.
GND
-Vcc
+Vcc
PROTECTOR
IC601 TA7317P
IMP GATE
DC L
DC R
OUT
POWER LAMP
AC 4.4V
AC 10.6V
AC 10.8V
HEAD PHONE
METER LAMP
PL801
PL802
PL803
PL804
TXX-344-3
TXX-344-4
SPK-1 LAMP
SPK-2 LAMP
SPK-1
SPK-2
ON
OFF
SYSTEM 1
SYSTEM 2
RY501
RY502
RY201
RY202
RY701
X201
X203
X205
X207
X209
X211
X213
X215
X217
X218
X009
X001
X003
X017
X015
X019
X021
X005
X007
X011
X208
X012
X212
X216
X214
X210
X206
X010
X204
X008
X006
X022
X020
X016
X018
X002
X004
X401
X403
X405
X417
X451
X453
X408
X404
X418
X402
X601
X602
D701
PB102F-6
D702
PB102F-6
D601
S2VC20R
D602
S2VC20
D703
S2VC20
D704
D705
IS2076-31
RD4.7EB2
2SA1210(S,T)
2SC2238B(0)
2SC2565LB(0)
2SC2565LB(0)
2SD1064UA(R)
2SD1064UA(R)
2SB828UA(R)
2SB828UA(R)
2SA1095LB(0)
2SA1095LB(0)
2SA968B(0)
2SC2912(S,T)
2SA1084(D,E)
2SC2240(GR,BL)
2SA970(GR,BL)
2SA965(O,Y)
2SC2235(O,Y)
2SC2910(S,T)
2SB536(L,M)
2SK246(BL,V)
P201
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J201
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J504
J601
J801
P501
P502
P503
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P801
TP1
TP2
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TP6
TP7
TP8
TP9
TP10
TP11
TP12
TP13
TP14
PL 1
PL 2
PL-3
S801
S802
SPK-1
SPK-2
R289 33F.RES
R217 100 F.RES
R239 27F.RES
R243 27F.RES
R235 33F.RES
R247 47F.RES
R229 150F.RES
R285 10 F.RES
R251 4.7 F.RES
R211 47K
R215 560 F.RES
R233 68 F.RES
R255 0.22 (2.5W) CEM.
R257 0.22 (2.5W) CEM.
R259 0.22 (2.5W) CEM.
R261 0.22 (2.5W) CEM.
R213 47K
R253 4.7 F.RES
R249 4.7F.RES
R231 100 F.RES
R287 10 F.RES
R209 330F.RES
R237 33F.RES
R245 27 F.RES
R241 27 F.RES
R219 100 F.RES
R207 330 F.RES
R273 47 F.RES
R267 10(2W) UNF. M.F.
R265 2.2 F.RES
R269 10 (2W) UNF M.F.
R293 10(2W) UNF. M.F.
R271 0.22 M.M.
R291 4.7Ω
R501 220K
R502 220K
R503 68K
R504 68K
R507 820
R508 820
R505 470(B)
R506 470(B)
R509 470(2W) UNF.O.M.F.
R510 470 (2W) UNF.O.M.F.
R511 1.2K (1/2) UNF.C.
R512 56Ω(1/2)UNF.C
R513 56Ω(1/2)UNF.C
R515 1K
R516 1K
R601 68K
R602 68K
R603 27K
R604 27K
R605 68K
R606 390K
R607 22K
R608 56K
R609 10K
R610 2.7K
R611 33K
R612 10K
R613 22K
R614 22K
R616 15K
R617 47K
R618 120K
R620 1 (1W) UNF.M.F.
R621 2.2 UNF.C
R622 2.2 UNF.C
R623 18K
R624 UNF.C 1K(1/2)
R801 56(1/2)
R802 56(1/2)
R803 56(1/2) UNF.C
R804 56(1/2) UNF.C
C201 56P P.S.
C205 47P P.S.
C207 68P P.S.
C203 68P P.S.
C401 P.S. 470P
C403 470P P.S.
C451 4.7μ 100V
C453 4.7μ/100V
C501 0.0033
C503 1μ NP
C504 1μ NP
C502 0.0033
C505 47μ/10V
C506 47μ/10V
C601 47μ 10V
C602 47μ 10V
C603 22μ/16V
C604 0.015
C605 0.0022
C606 0.047μ/50V
C607 10μ 50V
C608 47μ 50V
C609 220μ 35V
C610 220μ 35V
C215 56P P.S.
C225 0.047 M.M.
C226 0.002
C231 0.022 M.M.
C232 0.022 M.M.
C234 0.022 M.M.
C236 0.027
C235 0.027
C454 10μ 50V
C701 10000μ 80V
C2 10000μ 80V
C3 10000μ 80V
C4 10000μ 80V
C704 22μ 16V
C703 47μ 100V
D203 VD1220
D205 VD1220
D207 IS581
D209 IS581
D211 IS581
D401 IS581
D403 IS581
D415 IS581
D416 IS581
D417 IS2076-31
D419 IS2076-31
D420
D501 IS2076-31
D503 IS1925
D504 IS1925
D204
D206
D208
D210
D212
D214
D216
D218
D220
D222
R401 1K
R403 1K
R405 27K
R407 27K
R409 1.2K
R411 1.2K
R437 12K
R439 15F.RES.
R441 15F.RES
R442
R404
R408
R412
R406
R410
R402
R438
R440
R452
R451 2.2K
R455 33K
R456 470
R458 22K
R460 22K
R459 1K
R704 120 (1/2) UNF. C
R705 SDT-35
R703 39K
R701 6.8(10W) CEM. RES.
R702 6.8(10W) CEM. RES.
R220
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R274 47 F.RES
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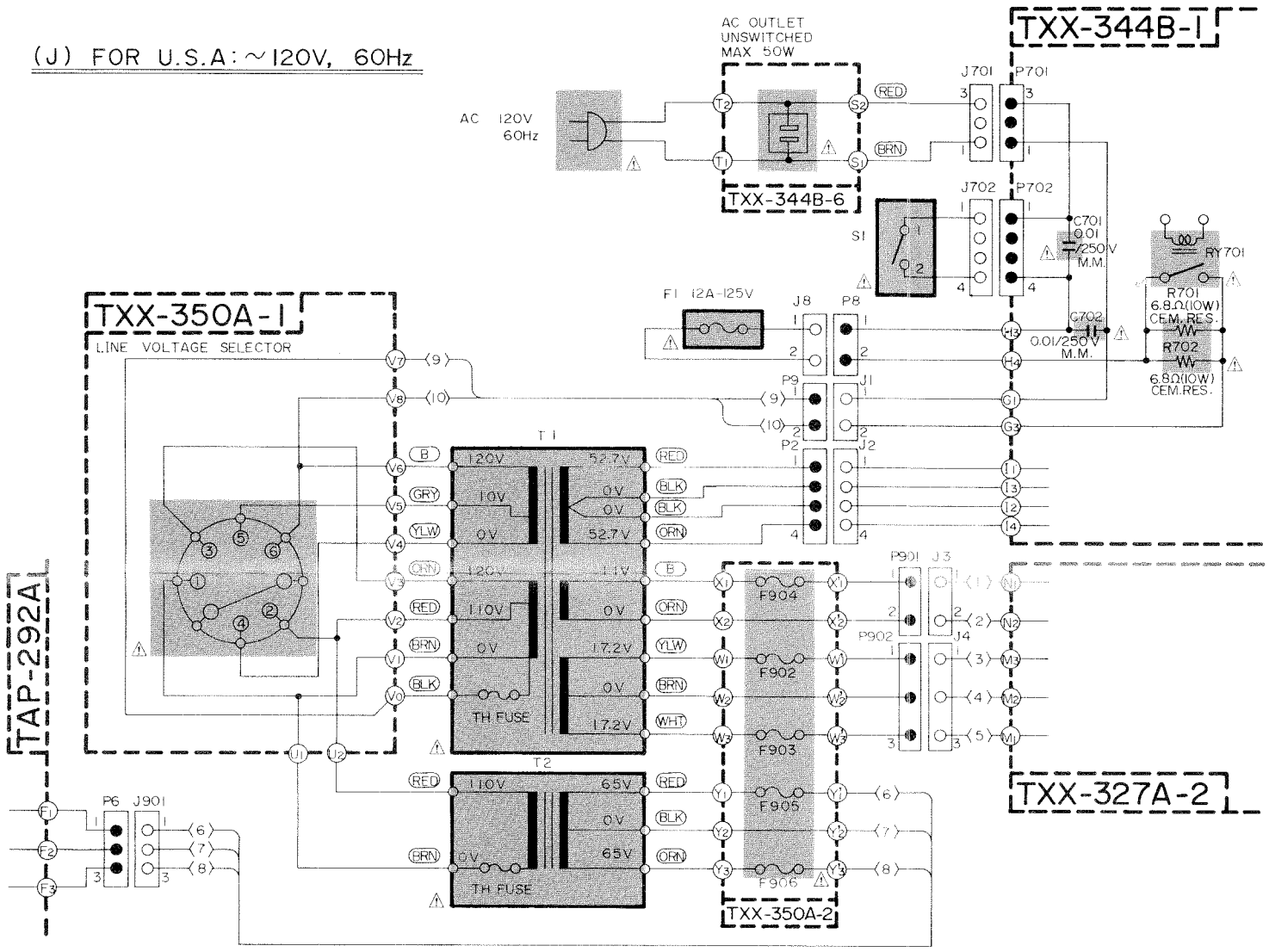
# Power Supply Circuit

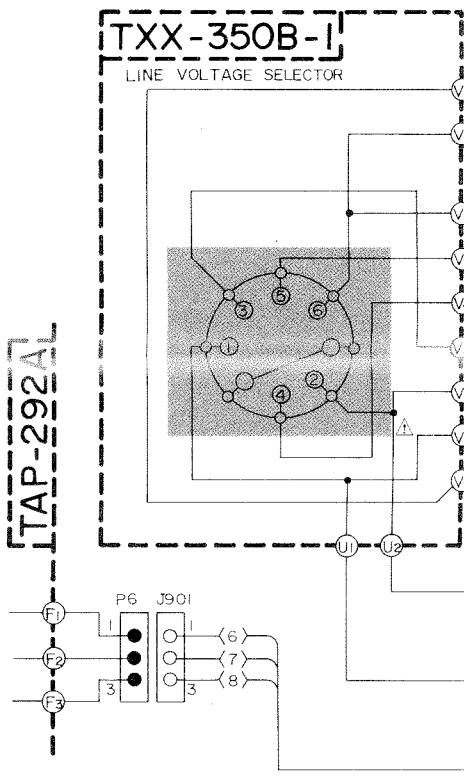
(J) FOR U.S.A: ~120V, 60Hz



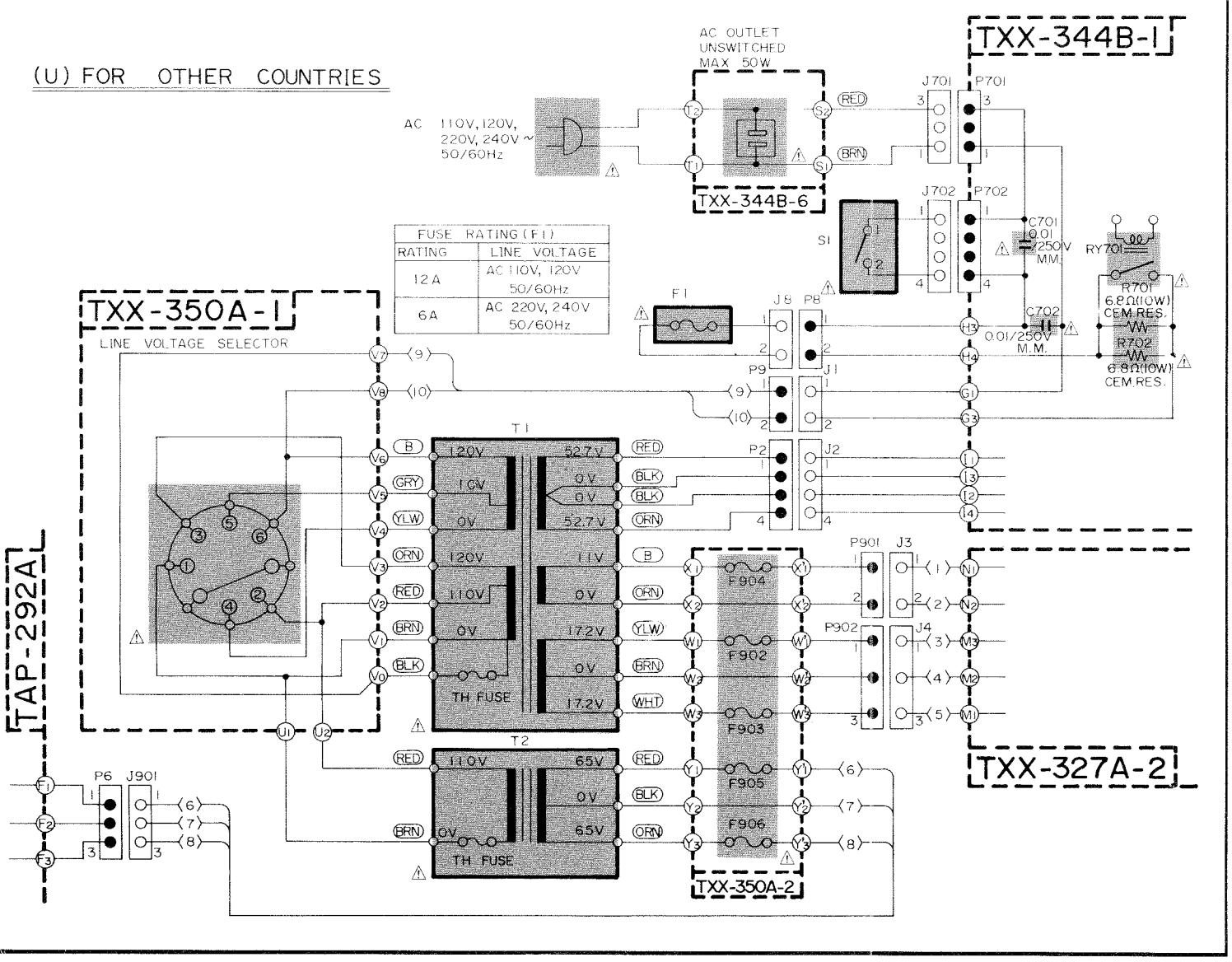

(E), (B)

(E) FOR EUROPE: ~ 220V,

(B) FOR U.K. : ~ 240V,



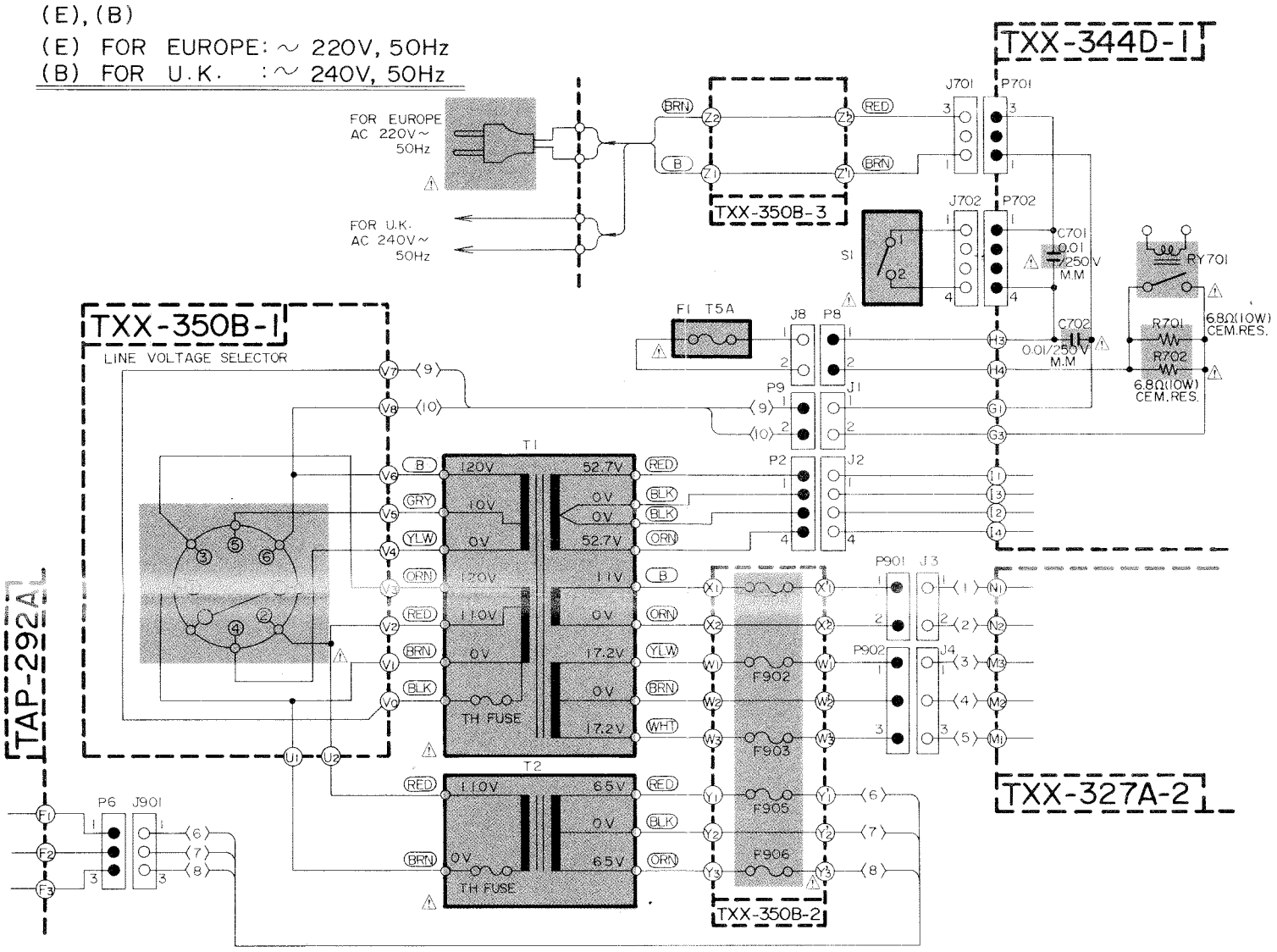

(U) FOR OTHER COUNTRIES



(E),(B)

(E) FOR EUROPE: ~ 220V, 50Hz

(B) FOR U.K. : ~ 240V, 50Hz




VOLTAGE SELECTOR CONNECTION(TOP VIEW)